American Foundryman

The Foundrymen's Own Magazine **POST** *Convention Issue, June 1954*

ACCURATE

MULTI-CAVITY DUMP BOX

UNIFORM IMPRESSIONS . . . LOWER COST

The 8 gang dump box shown in this unretouched photograph was made from the single wood master core plug and backing frame. The same method may be used for two part split or booked type core boxes with flat or irregular partings. Added savings plus greater accuracy are assured when properly cleared white metal or aluminum master dryer patterns are also made by this same process.

There is real profit in this idea for you. Hundreds of foundries are now using this modern streamlined method of making core boxes and master dryer patterns because it is accurate, saves machining and offers large savings in the more intricate and gang type core boxes.

By Air Freight, Parcel Post, Special Delivery or Railway Express. Pick-up and delivery by jobber representatives in the following areas . . .

AUBURN, MASS.
Henry A. Kottmann
Telephone: Auburn 2683

MILWAUKEE, WIS.
John M. Donohue
Telephone: Hilltop 2-7130

DETROIT, MICH.
Harry H. Brown
Telephone: Midwest 4-8300
(Res. Birmingham, Mich.)

LOS ANGELES, CALIF.
McGowan Company, Inc.
Telephone: Trinity 2057

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ACCURATE MATCH PLATE COMPANY

WEST CARROLL AVENUE • Telephone: SEeley 3-7918 • CHICAGO

American Foundryman

Volume 25 *June 1954* *Number 6*

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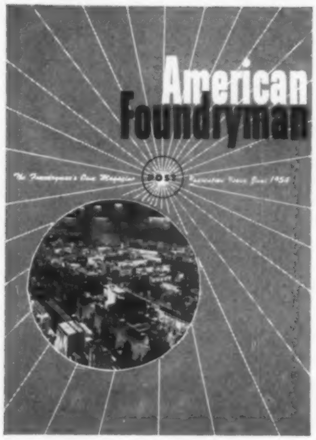

In This Issue . . .

Departments . . .

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Famous
a BETTER FUTURE for YOUR MOLDING ROOM
pre-measured
SCORED BRICK FORM
(Approx. 4 lb. brick)
Minimized
CASTING REJECTS
AND SCRAP LOSS.

THE CUPOLA before using Famous Cornell Cupola Flux.

THE CUPOLA during use of Famous Cornell Cupola Flux.

simplicity 3′ x 8′ ring-type crusher recovers about 400 tons of sand per day

Through the use of just *one* Simplicity 3′ x 8′ Ring-Type Crusher, a leading automobile manufacturer realizes savings of about 400 tons of sand daily in grey-iron foundry operations. In this installation, lumps of sand, especially those from cores that do not break up in shakeouts or screening, are fed to the Simplicity Crushing Screen instead of being hauled to the dump, as is the practice in many foundries. The recovered sand is returned by conveyor to sand storage and mulling equipment thus making appreciable savings in new sand requirements as well as eliminating the cost of hauling away sand lumps. With a Simplicity, one unit does both crushing and screening. It gives positive crushing action and maximum production of grain-size sand. Simplicity Crushers are available with either one, two, or three sets of rings, depending on the lump size to be crushed.

Simplicity Crushing Screens are in profitable operation today in foundries producing magnesium, aluminum, steel, malleable iron, and grey iron castings . . . why not put one to work in your foundry?

A Simplicity sales engineer will be glad to give you the full story. Write us.

103

Sales representatives in all parts of the U. S. A.

FOR CANADA: Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario

FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

Simplicity

TRADE MARK REGISTERED

ENGINEERING CO. • DURAND, MICHIGAN

Pangborn Blastmaster® Barrel

Cuts Cleaning Time 2½ hrs. a day

for the Utica General Jobbing Foundry

Only absolutely clean castings will do in the manufacture of refrigerating equipment. That's why the Utica General Jobbing Foundry, Utica, N. Y., (90% of whose output is for the refrigeration industry) replaced its old cleaning barrel with a Pangborn Blastmaster Barrel. Now Utica not only gets an excellent finish on all castings but saves 2½ hours operating time daily with this machine! To quote George Buccolo, president of the firm: "Both from the standpoint of low cost and high quality, we feel our Pangborn Blastmaster is the best equipment available."

You, too, will be pleased with the *better lower-cost,* faster cleaning that a Pangborn Blastmaster Barrel gives you. (For even lower costs, Pangborn recommends the use of Malleabrasive* in your Blastmaster.) Investigate the Blastmaster now! Available in 1⅓, 3, 6, 12, 18 or 27 cu. ft. capacity. For more details, write for Bulletin 223A to: PANGBORN CORPORATION, 1300 Pangborn Blvd., Hagerstown, Md. And ask about *Malleabrasive*—recommended by Pangborn for use in all Pangborn equipment.

Pangborn

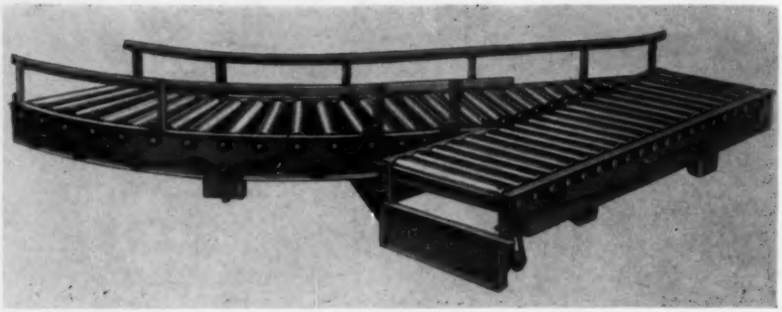
Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

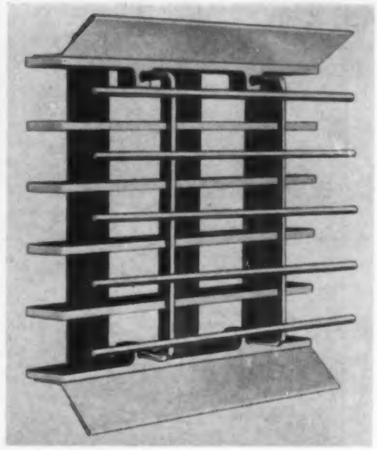
BLAST CLEANS CHEAPER
with the right equipment for every job

*U. S. Patent # [illegible]
(other patents pending)

PANGBORN'S 50th ANNIVERSARY—1904-1954

Products and Processes





Conveyor Section

New, compact, power driven "Y" unit that eliminates clogging and "jam ups" on converging conveyor lines by keeping material moving has recently been developed. Unit consists of a power driven 90° roller conveyor curve and a five ft long, live straight roller conveyor section, both of which are chain driven by a single ½ hp gearhead motor through universal joints. Offering speeds up to 90 fpm, the Ferguson Power "Y" can be incorporated into all types of package conveyor lines, floor or suspended. *Harry J. Ferguson Co.*

For more data, circle No. 312 on p. 17

Magnetic Grate Separator

Designed to be placed in hopper throats or floor openings, Homer Magnetic Grates are said to trap even the smallest and most elusive tramp iron particles, preventing their entrance into expensive machinery or causing product contamination. Unit consists of a wire grid with horizontal rods placed between highly saturated Alnico No. 6 magnetized bars. The horizontal rods deflect free flowing material into streams which wipe the magnetized bars. Unit is also said to prevent large debris of all kinds from passing through. *Dept. 249, Homer Manufacturing Co., Inc.*

For more data, circle No. 315 on p. 17

Beta-Gamma Instrument

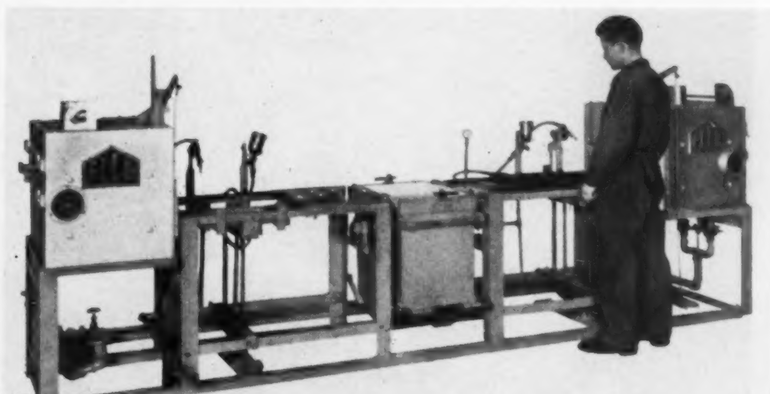
Model AGB-10-SR ionization type Beta-Gamma survey instrument will detect increments in radiation as small as .002 mr/hr above background. Logarithmic response permits readings from .01 mr/-hr to 10.000 r/hr to be covered in only three ranges. First ⅓ of lowest range is from .01 mr/hr to 0.1 mr/hr. Accuracy is better than 10 per cent of reading at all levels, it is claimed. Simple circuit and low voltages provide reliability at low cost. Light weight probe comprises only the ion chamber and meter. Control unit contains printed circuits, mercury batteries for 350 hrs continuous use and a calibration check source of less than 1 uc that is used for all ranges. *Jordan Electronic Mfg. Co., Inc.*

For more data, circle No. 313 on p. 17

Replacement Blades

Tisco Replacement Blades for airless blast units are made of a special alloy strongly resistant to abrasion. Blades are carefully heat treated and oil quenched to a Rockwell C hardness of 65 and a Brinell hardness of 700. The blades, it is claimed, are accurately ground to gauge on all fitting dimensions and are inspected to assure maximum smoothness on the wearing surface. *Taylor-Wharton Iron and Steel Co.*

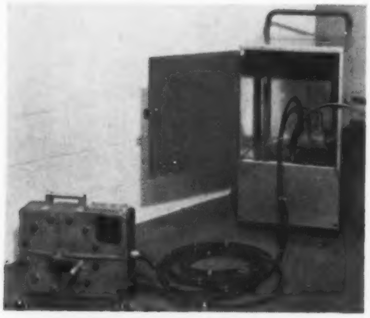
For more data, circle No. 314 on p. 17



Shell Molding

Shelmolda is a two-station machine for making sand or resin molds and is controlled by one worker. Working cycle is about two minutes and capacity is forty molds per hour, it is claimed. Effective area of the pattern plate is 23x15 in. Fabricated framework carries two molding units, each comprising gas-fired oven for pre-heating and curing and ejection station; together with central dump box servicing both molding units. *Fairbairn Lawson Combe Barbour, Ltd.*

For more data, circle No. 316 on p. 17



Radiographic Equipment

Design and production of the PES (Panoramic Exposure Shield) for use in Cobalt 60 radiography has been announced. It was developed to permit safe handling of strong radioactive sources for three specific requirements: exposures in internal locations; radiography where electric power is not available, and panoramic exposures. Available in two models, No. 202 and 402, both models consist of three basic units: the source shield, the source tube, and the control cable. *Technical Operations, Inc.*

For more data, circle No. 317 on p. 17

Dielectric Core Ovens

Three basic models of the Coleman Dielectric Core Ovens, with ratings of 15 KW, 25 KW, and 60 KW each, are presently being offered. Ovens feature an integral, unitized design in which the oven conveyor, high frequency generator and control circuits combine to form a rugged functional unit. Automatic "load monitor" and push button spacing of the electrode free the operator from the necessity of making frequent adjustments, it is pointed out. Complete safeguards are incorporated to protect the operators and equipment. *Foundry Equipment Co.*

For more data, circle No. 319 on p. 17

Here's How ACCO Casting Div., American Chain & Cable Co., Reading, Pa., applied a simple yet ingenious method of correcting defects and removing excess metal from large steel castings by use of the Kwik-Arc Jet Torch Process. Results claimed are better quality work and reduced time-consuming cleaning operations by as much as 75 per cent. Jet torch consists of a ½-in. diameter carbon electrode, secured in a holder, with a small air jet beneath it. When ignited, the electrode generates an electric arc of 6,000 F which melts shrinks, cracks, fused-in sand, fins, brackets, nails, etc., like water. The accompanying jet of air blows the molten metal and slag away, leaving a casting of generally uniform contour. The jetted area cools in a few minutes and is then rebuilt with sound weld metal before the casting reaches the chipping and grinding operation. In addition to speeding up the cleaning operation, this process removes much less "parent metal" than is possible with a chipping gun, and keeps subsequent welding and grinding to a minimum, it is pointed out. It does not, however, cover defects which might show up later. Main outlay was for the erection of metal welding booths to house the operation and to protect other workers in the area from the intense light. The jet torch operator wears a welder's helmet and the usual protective clothing. *American Chain & Cable Co., Inc.*

For more data, circle No. 318 on p. 17

Hardness Testing

A portable bench-type hardness testing instrument has been perfected which has an exclusive design combining a positive controlled diamond penetrating action with a high power microscope of 400 magnifications. The microscope is swung directly over the impression to read the hardness by measuring with a reticule scale and vernier in .0005 mm resulting in hardness readings of unusual precision in half a micron. Instructions and tables are furnished with the instrument converting readings into Rockwell and other standard hardness scales in use. *George Scherr Co., Inc.*

For more data, circle No. 320 on p. 17

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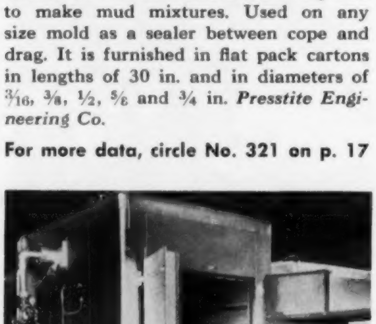
Bead-Type Sealer

Development of Kopeseal, a new, already prepared bead-type sealer for use between cope and drag in casting operations, has been announced. It is said to be superior to luting mud and other sealing materials now in use. It is a permanently soft mastic compound extruded and furnished in rope-like beads. Easy to handle and apply by peeling from its special paper backing and quickly placing around the perimeter of the drag. Primary advantages claimed are that it is more pliable, efficient and economical and, as a prepared product, eliminates the time and trouble required to make mud mixtures. Used on any size mold as a sealer between cope and drag. It is furnished in flat pack cartons in lengths of 30 in. and in diameters of 3/16, 3/8, 1/2, 5/8 and 3/4 in. *Presstite Engineering Co.*

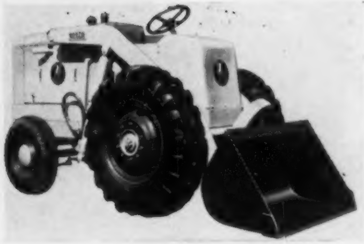
For more data, circle No. 321 on p. 17



Kiln Type Oven

New line of standard Kiln Type Ovens for baking, heating, drying and curing, has been announced. Ovens are designed to include several of the custom-built features not ordinarily found in standard ovens. They are available in six sizes, with work space ranging from 4 ft wide by 4 ft deep by 6 ft high to 6 ft wide by 7 ft deep by 6 ft high. Units operate on either gas fuel or electricity. *Michigan Oven Co.*

For more data, circle No. 322 on p. 17



Torque-Converter-Drive

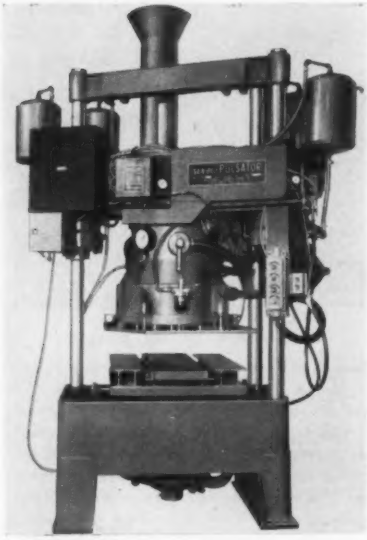
New HA and HAH front-end shovel-loaders, with torque-converter-drive as standard equipment, are now available. In addition, the HAH model is equipped with power steering. The HA has a pay-load capacity of 16 cu ft and a struck-load capacity of 12 cu ft. The HAH has a pay-load capacity of 24 cu ft and a struck-load capacity of 18 cu ft. New units offer improved performance with the torque converter, which is of the three-element, self-cooled type that automatically multiplies torque output of the engine in direct proportion to the load requirements. During light-load conditions, it automatically reverts to efficient fluid coupling action. *Frank G. Hough Co.*

For more data, circle No. 323 on p. 17

Centerless Grinder

Self-integrated centerless grinder can operate as a through-feed, in-feed crushed form or template diamond dressed form grinding machine. In-feed grinding adapts the machine for producing formed, tapered, or perfectly concentric multiple diameter work. Work capacity is from 1/16 to 5/8 in. diameter on steel and up to one in. diameter on non-ferrous, ceramics, carbon, glass, cork, rubber, plastics and other low tensile material. Grinding wheel measures 12 x 2½ x 5 in. and is driven by a 3 hp motor and the 7 in. feed wheel by a separate ½ hp geared motor with speeds of 21, 42 and 320 rpm. *American Herforder Corp., Div. Metal Removal Co.*

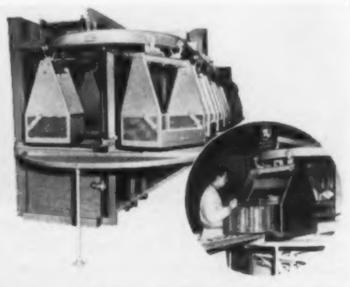
For more data, circle No. 324 on p. 17



Core Blower Attachment

An attachment has been introduced for the line of San-Blo core blowers that holds core box wear to a minimum, it is claimed. Known as "LPP" (low pressure pre-fill), it first pre-fills the core box with sand under low pressure and then switches to full line pressure to pack the sand to correct hardness. A pre-fill timer and pre-fill air valve are provided for adjusting the system to the sand and box to be blown. When box is in position and the blow button pressed, air from a low pressure line enters the air circuit to begin moving the sand into the core box. As soon as the box is filled, the timer opens the large blow valve and air and sand under full line pressure enter the box to pack the sand to correct hardness. *Federal Foundry Supply Co.*

For more data, circle No. 325 on p. 17



Batch Cleaning

New automation development, the Magnus Aja Lif Automatic, is a fully automatic multi-stage batch cleaning and processing method. Equipment consists of a series of independent, self-controlled dipping units serviced by an automatic conveyor system. Dipping, raising and transfer of the parts from one stage to the following stages is not only fully automatic, but in addition, work to be processed is vigorously agitated up and down in each solution. *Magnus Chemical Co.*

For more data, circle No. 326 on p. 17

continued on page 17

Products & Processes

Fill out postcard below for complete information on products listed in these pages.

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CONVENIENT FORM FOR ORDERING INFORMATION

pH Meter

Three meter units now available are: Photovolt pH Meter Model No. 115, Photovolt Portable pH Meter Model No. 125, and Photovolt Photoelectric Glossmeter Model No. 660. Model 115 is a full-fledged line-operated pH Meter, simple in operation and maintenance; fast and dependable in service, and fully stabilized for wide range of line voltage fluctuations. Model 125 is powered by only 3 ordinary radio batteries, and gives 2,000 hours service, it is claimed. Model 660 comprises two units: the control unit, which contains the indicating instrument and controls, and the search unit, which contains the light source and photocells. *Photovolt Corp.*

For more data, circle No. 327 on card

Release Agents

Two new silicone release agents, F-496 and F-452, have been developed for shell molders who wish to use solvent-type agents rather than water emulsions. They contain 5 and 50 per cent solids, respectively, of high viscosity silicone fluids in mineral spirits. Designed especially for use on deep draw, narrow draft patterns, new silicone parting agents leave minimum build-up, ease pattern cleaning and provide multiple releases, it is claimed. While F-496 is designed for immediate use, F-452 is recommended for those who may wish to make up concentrations to meet their own specific operating requirements. Readily dilutible in mineral spirits, manufacturer points out it will not separate in storage after dilution. *Dow Corning Corp.*

For more data, circle No. 328 on card

Conveyor Lubricator

Automatic trolley conveyor lubricator lubricates monorail conveyor wheels accurately with oil or grease, manufacturer claims. Unit is adjustable for quantity from 0 to .05 cu in. per wheel. It is quickly installed while conveyor is running by attachment to I beam rail. Airline is the only connection required. Nozzles make sustained, straight line contact with grease fittings during injection—thus eliminating drippage. Automatic stop shuts lubricator off, if desired, after conveyor has made one round. Furnished complete with pressurized one gallon lubricant container, air pressure regulator, airline oiler and all material necessary for installation. *Moore Lubricator Co.*

For more data, circle No. 329 on card

Sand Screen

Sand Screen, Carborundum's new non-clogging open-mesh abrasive material, designed especially for sanding operations where loading or glazing is a problem, is now available. Extensively field tested in the sanding of ferrous and non-ferrous metals, Sand Screen has been found to give 7 to 15 inches longer life than conventional coated abrasives, it is claimed. It can be used wet or dry, for both machine and hand sanding operations, and is coated uniformly on both sides, with silicon carbide grain. Its unique, open-mesh construction reduces loading to a minimum, by permitting sanding residue to flow freely through the numerous openings, and also enables the material to be used on both sides, it is pointed out. It comes in full sheets, cut sheets and discs, in grit sizes of 180 and finer. *The Carborundum Co.*

For more data, circle No. 330 on card

Eye Sweep

G-S Eye Sweep is a valuable unit of first aid. One end is fitted with a magnet for recoving steel splinters, while the other is fitted with flexible loop for removing cinders, dust and other particles. Sterilization of the instrument will not diminish the magnetic qualities nor effect the loop. A hard rubber carrying case is provided with each sweep. *General Scientific Equipment Co.*

For more data, circle No. 331 on card

Readers Service Dept.

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Please send me detailed information on the Products and Processes.

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Free Foundry Information

For additional information

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Copper Castings

"Better Castings," Vol. XXIV, No. 2, tells how to make high electrical conductivity copper castings with "Falls" No. 11 Alloy. Pamphlet also points out how "Falls" 20/80 Magnesium Copper and 20/80 Magnesium Nickel have been developed for the purpose of introducing magnesium into cast iron for the production of Nodular Graphite Cast Iron. *Niagara Falls Smelting & Refining Div., Continental Copper & Steel Industries.*

For more data, circle No. 332 on card

Trolley Ladles

Pamphlet 18-A and B cover taper side trolley ladles. Paper describes standard equipment; outlines construction and gives specifications. Also available is bulletin 11-A describing cradle type crucible tongs with new self-adjusting contact pads. *Industrial Equipment Co.*

For more data, circle No. 333 on card

Air Conditioned Crane Cabs

Booklet AC 544 describes many features claimed to be exclusive in the field of air conditioning crane cabs and as contributing to low cost operation and low maintenance. Accompanying the description is a chart of applications (type of crane operation) temperatures encountered, and model recommended for the particular conditions. *Lintern Corp.*

For more data, circle No. 334 on card

Blast Cleaning Accessories

Bulletin 300C describes the accessories and supplies which are available for use with Pangborn blast cleaning equipment. Includes engineering selection data as well as specifications. Accessories include: helmets, gloves, hoses, nozzles, aprons, blast room accessories and repair parts. Several pages are devoted to correct selection of abrasives according to cleaning requirements. *Pangborn Corp.*

For more data, circle No. 335 on card

Plunger Pillar Presses

Folder gives extensive details on modernized line of multiple plunger pillar presses. Complete specifications and capacities are given in tabular form for six sizes of presses. Bulletin illustrates several sizes of the machines and pictures examples of the type of work produced. Close-up views show details of important portions such as the tooling arrangement. *Waterbury Farrel Foundry and Machine Co.*

For more data, circle No. 336 on card

Research Suggestions

Bulletin offering research suggestions for refractory users and producers is now available. Included are suggestions for reactions between refractories and molten metals; refractories for service above 3200 F; special refractory joint material; insulating refractory products, and many others. *Battelle Memorial Institute.*

For more data, circle No. 337 on card

Alloy Density

Pamphlet emphasizing the uniformity, high purity and density of Specialloy's electric furnace alloy products is now available. Featured also are the engineering services available. Alloys shown, cover a wide range of composition from high-conductivity non-ferrous alloys to heat and corrosion resistant ferrous alloys. *Specialloy, Inc.*

For more data, circle No. 338 on card

Melting Furnaces

Bulletin No. 105 describes manual tilt crucible melting furnaces for brass, bronze and aluminum. Folder contains several illustrations of both gas and oil fired units and also includes specifications of the furnaces. *Stroman Furnace & Engineering Co., Div. of Petersen Oven Co.*

For more data, circle No. 339 on card

Temperature Indicators

New eight-page Bulletin A-303 describes two portable temperature indicators, Potentiometer Indicator and Resistance Thermometer. Instruments are used by industry for periodic temperature tests to spot impending troubles in equipment such as heating units and test furnaces. Described are operating adjustments, features of design, test circuits, measuring elements and instrument specifications. An entire page is devoted to listing standard scales available. Tables also

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Free Information

Continued from page 18

list type of thermocouple or resistance bulb recommended for each range, as well as the degrees of temperature indicated by each scale division. *Foxboro Co.*

For more data, circle No. 340 on p. 18

Speedmullors

New bulletin features the Series A Speedmullor. Explains how with maximum mulling efficiency, amount of expensive bonding additions needed to obtain specified properties is reduced. Points out how independently conducted tests have proved that the Speedmullor coats sand with bond more than three times as fast and up to twice as thoroughly as the old metal to metal mixers. Between-rubber mulling, advantages of aeration during mulling, fast thorough discharge, and high-pressure centrifugal mulling; are all factors claimed for savings on materials. *Beardsley & Piper, Div. Pettibone Mulliken Corp.*

For more data, circle No. 341 on p. 18

Instruction Manual

Bulletin 200-A includes instructions and servicing information on 9000 Model R. pH Indicator, 9001 Model ph Amplifier, 9002 Model RM Millivolt Indicator, flow and immersion assemblies; glass, reference, and metallic electrodes; connector box and cable assembly, and automatic and manual multiple switches. Booklet is divided into three sections covering: operating instructions; maintenance and testing, and instructions for accessories. *Beckman Instruments, Inc.*

For more data, circle No. 342 on p. 18

Gantry Cranes

Bulletin PG-648 illustrates and describes 1-ton Industrial Gantry Cranes. Booklet points out many possible uses for crane, construction and general dimensions. Crane weight, without hoist or trolley is 595 lb. Booklet also illustrates various models of Jib, Push Type, Hand Geared, Motor Driven and Double Girder cranes. *Industrial Crane & Hoist Corp.*

For more data, circle No. 343 on p. 18

Ingot Specifications

Lavingot, Vol. 10, No. 1-2, lists simple charts which indicate at a glance the essential data pertaining to nonferrous ingot and casting alloys. Included for reference are specification numbers, chemical compositions, physical properties and test bar designs. Copper anodes, type metals, deoxidizers, degasifiers and fluxes are also discussed. *R. Lavin & Sons, Inc.*

For more data, circle No. 344 on p. 18

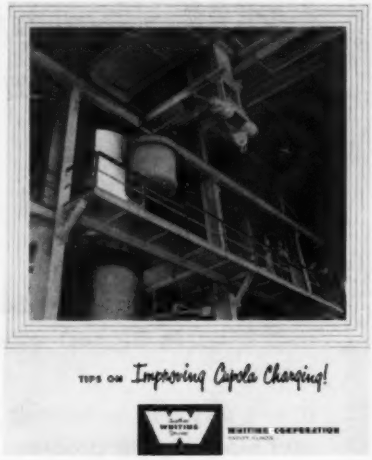
Industrial House Organ

First issue of new-style industrial house organ, Radiation Digest, has just been published. Publication includes predictions on growth of industrial x-ray, plans for a West Coast School on X-Ray Diffraction, improving x-ray films, applications for cathode rays, promise of linear accelerators, how to reduce x-ray film processing time, fast control with x-ray fluorescence analysis, and semi-automatic research through a combination of x-ray diffraction machines and analog computers. *General Electric Co.*

For more data, circle No. 345 on p. 18

Cupola Charging

Bulletin No. FO-2, Tips on Improving Cupola Charging, points out how charging has progressed; lists the "ideal" charging method, and the practical charging method. Preparation of the charges;



records to be kept, and quality control are also included. Pamphlet refers to transporting charges to the cupola; flexibility in equipment; handling coke, and depositing the charges in the cupola. *Whiting Corp.*

For more data, circle No. 346 on p. 18

Cut-Off Wheels

Twelve-page catalog describing complete line of Sawco rubber and resin-rubber bonded grinding and cut-off wheels, mounted points and abrasive sticks and blocks is now available. Booklet also describes specialized facilities for manufacturing special wheels. Simplified pricing system has been compiled and is available with the catalog. *Sandusky Abrasive Wheel Co., Inc.*

For more data, circle No. 347 on p. 18

Level Indicators

Catalog describes and illustrates complete line of pressure-actuated bin level indicators for use indicating the level of granular, pulverized and semi-liquid materials stored in tanks, silos, hoppers and bins. Booklet supplies complete installation data for various types of units; for thick or thin-walled bins, inside or outside locations and for suspended interior installations. *Bin-Dicator Co.*

For more data, circle No. 348 on p. 18

Core Dryer

New 12-page bulletin, 15B7306C, describes important features of the Foundromatic core dryer that result in simplified core making and explains how such drying fits existing setups. It carries a performance chart which shows that the moisture content in a core determines the amount of electrical energy absorbed by the core while it is between electrodes. Answers are also supplied to 19 commonly asked questions concerning the operation. *Allis-Chalmers Mfg. Co.*

For more data, circle No. 349 on p. 18

Roller Bearings

Book No. 2565 describes Series LPK-6800F, heavy duty roller bearings, especially designed for the severe operating conditions found in foundries, steel mills and mines. Included in the booklet are dimensions and load ratings. *Link-Belt Company.*

For more data, circle No. 350 on p. 18

Die Casting Machines

Bulletin describes Models 50 and 100 die casting machines. Model 50 for aluminum, brass or magnesium alloys, can be equipped for casting zinc, tin or lead by a change of hot metal end. Model 100 for zinc, tin or lead can be changed to convert to cold chamber machine by change of hot metal end, it is pointed out. *Cleveland Automatic Machine Co.*

For more data, circle No. 351 on p. 18

Blasting Process

New illustrated six-page booklet describes in detail regular and high velocity pressure blasting process and its applications in the field of deburring, cleaning, scale removal, etc. Also included is the full range of available manual and automatic units. *The Cro-Plate Company.*

For more data, circle No. 352 on p. 18

Carrier Equipment

Bulletin C1 10M-9-53 illustrates many uses for Ross Carriers. Also listed is chart showing model, package size, load capacity in lb, weight in lb, wheel base, length over-all, width over-all, height over-all power plant, and road speeds. Illustration of many of the various type models are also included. *Clark Equipment Co.*

For more data, circle No. 353 on p. 18

Scale Models

Folder outlines some of the applications of three-dimensional scale models in business and industry. The illustrated, four-page folder shows how such models can be used to advantage in plant layout, site development, architectural and structural planning, product development and as sales aids. *Knight Models, Inc.*

For more data, circle No. 354 on p. 18

Placing lightweight shavings and chips near discharge end provides a cushion that protects the furnace lining from heavier scrap.

LINK-BELT Oscillating Conveyor proves highly effective charging induction furnace at New England foundry

By installing a Link-Belt Oscillating Conveyor to charge their large capacity electric induction melting furnace, this New England non-ferrous foundry achieved two important advantages:

(1) An entire furnace batch (2½ tons) of brass mill scrap, chips and shavings can be loaded on the conveyor at one time—freeing the operator for other duties.

(2) Positive Action (see box) smooths concentrated loads to a uniform, continuous flow at the furnace.

Over a thousand Link-Belt Oscillating Conveyors are operating successfully in foundries. They find additional use separating sand and castings when the feed end section has a perforated plate bottom that acts as a shakeout.

Remember, too, you can now save time and money because 36 in. wide sections are carried in stock. These pre-engineered sections can be built up to any desired length.

Whether you need a single machine or a complete sand and castings handling system—call on Link-Belt. Our engineers will work with you and your consultants—help you get the finest in mechanized facilities.

How Positive Action moves materials

Positive-action, constant-stroke eccentric provides a powerful, yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges. Resonant spring action of resilient legs cuts power requirements to a minimum.

LINK-BELT

CONVEYORS AND PREPARATION EQUIPMENT

MEMBER FEMA FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC.

13,162

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Sydney; South Africa, Springs. Representatives Throughout the World.

AJAX-NORTHRUP
HIGH MELTING SPEED

saves more than just TIME

Time saved . . . more heats . . . increased production are obvious benefits of AJAX-NORTHRUP Hi-Speed Induction Melting. Perhaps not so obvious, however, are many additional savings . . . important whether you have one melt a day or twenty.

The AJAX-NORTHRUP Induction Furnace melts so fast that there is practically no chance for oxidation. Without electrodes or combustion gases, there is almost complete freedom from contamination of any kind. Metal losses are virtually eliminated. Savings in even the base metals are substantial. In the costly and more easily oxidized alloying metals, savings are so large as to seem unbelievable . . . but they are true. A foundry casting 18-8 type alloys reports 100% recovery of nickel; 99% chromium; 95% molybdenum and similarly large percentages of every alloying element. A typical non-ferrous foundry reports reduced melting costs of over $33.00 a ton.

These savings can be realized in *any foundry*, ferrous or non-ferrous, providing an excellent return on your original investment in AJAX-NORTHRUP equipment.

We would be pleased to show you actual cost data that other AJAX-NORTHRUP Furnace users have made available. Just write or telephone us.

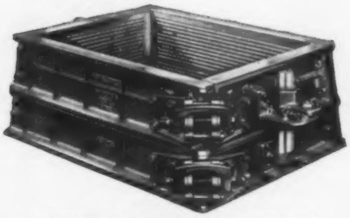
541

AJAX NORTHRUP *SINCE 1916*

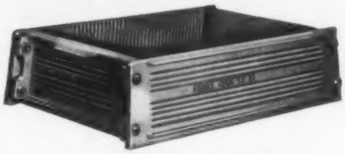
INDUCTION HEATING-MELTING

AJAX ELECTROTHERMIC CORPORATION • AJAX PARK, TRENTON 5, NEW JERSEY

Associated Companies: Ajax Electrometallurgical Corp. • Ajax Electric Furnace Co. • Ajax Electric Company, Inc. • Ajax Engineering Corp.



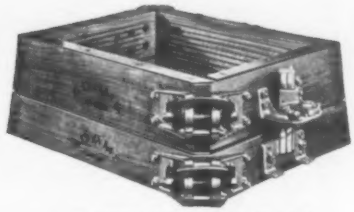
• ALUMINUM EASY-OFF FLASK



• ALUMINUM JACKET
CAST IRON JACKET

ADAMS FLASK EQUIPMENT

- Outstanding quality
- Exceptional performance



• CHERRY EASY-OFF FLASK

• STEEL JACKET

ADAMS MOLDING MACHINES

The speed, power, and durability for consistently large output, day after day.

Displayed at the 58th FOUNDRY CONGRESS SHOW in Cleveland, Ohio

If you didn't see Adams top quality line, write for catalogs today

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER ST., DUBUQUE, IOWA, U.S.A.

Foundrymen in the News

H. S. Eberhard . . . Caterpillar head

Caterpillar Tractor Co., Peoria, Ill., has elected **L. B. Neumiller** as chairman of the board. **H. S. Eberhard** becomes president, succeeding Mr. Neumiller. **H. H. Fair,** who resigned the board chairmanship, will continue as a director of the firm.

Crawford Steel Foundry Co., Bucyrus, Ohio, has appointed **W. J. Phillips** vice-president and general manager.

Lone Star Steel Co., Lone Star, Texas, has named **J. M. Brashear** to the position of general superintendent. **L. G. Graper,** vice-president, research and development, assumes the duties of **W. R. Bond,** former operations vice-president, now retired. **A. J. Malone** is now assistant general superintendent, steel division; **Glenn Anderson** becomes assistant general superintendent, coke-iron ore division; **Steve Purcell,** superintendent, open hearth furnace department; **McCready Young,** superintendent, production planning department.

Terry Koeller, advertising manager and/or promotion manager for AMERICAN FOUNDRYMAN and the American Foundrymen's Society for the past 11 years, has resigned to open her own office at 201 N. Wells St., Chicago. As head of Terry Koeller Associates, she is currently handling public relations for several companies and will conduct a publicity program for AFS. Before joining the AFS staff in 1943, Miss Koeller had been associated in editorial and advertising work with such publications as *Popular Mechanics, Modern Advertising, Inland Printer, Circulation Management, and Automobile and Trailer Travel.*

C. W. Mueller, formerly executive vice-president and general manager, Universal Foundry Co., Oshkosh, Wis., has been elected president and general manager. Former president A. C. Ziebell is now chairman of the Board.

L. B. Neumiller . . . new chairman

R. W. Wilson has joined Electro Metallurgical Co., Chicago, as sales engineer. He leaves American Hoist & Derrick Co., St. Paul, Minn., where he was chief metallurgist and assistant foundry superintendent.

After three and one-half years with Catalan Corp., **John Shinn** has returned to the sales department of Dayton Malleable Iron Co., Dayton, Ohio. He started his foundry career at Dayton after graduation from Ohio State University.

Several personnel changes have been announced at American Emery Wheel Works, Providence, R. I. **A. L. Pierce,** after 46 years with the company, retired. **F. J. Darby** is now president and works manager; **H. O. Skoog,** vice-president and ceramic engineer; **Torrey Allen,** treasurer and general manager; and **W. W. Turner,** secretary and sales manager.

G. A. Profita has been named regional manager, manufacturing department, boiler division, Babcock & Wilcox Co. He has been with the firm since 1929.

G. A. Profita . . . manages boiler div.

C. F. Walton . . . G.I.F.S. staff

Gray Iron Founders' Society has appointed **Charles F. Walton** as its new Technical Director, suceeding the late C. W. Briggs. Walton was born in St. Paul, Minn. and received a degree in metallurgical engineering from University of Minnesota. After a year with Inland Steel Co., East Chicago, Ind., he spent the next four years as research engineer on casting design, stress analysis, and studies of cast iron metallurgy for the Association of Manufacturers of Chilled Car Wheels, Chicago. Following the next three years as foundry service engineer with Meehanite Metals Corp., Walton joined the faculty of Case Institute of Technology, Cleveland. On leave in 1952-53, he served as technical advisor on foundry productivity to the Republic of France. While with Case, he has served as consulting engineer to a number of foundries and other manufacturing firms. He will asume his new position with G.I.F.S. on June 7.

Harold Higinbotham has retired from active service as technical director for Acheson Colloids, Ltd., London, Eng. He will remain on the board of directors of the British unit of Acheson Industries, Inc., New York. **Howard A. Acheson,** president of the parent firm, retains the position of managing director, while **E. G. Clarke** has been appointed assistant managing director.

Two new West Coast sales managers have been appointed by Link-Belt Co., Chicago. **R. F. Coltart** takes over the Central Pacific division, with headquarters at the San Francisco plant. **B. M. Prestholt** now heads the Southern Pacific Division, headquartering at Los Angeles.

J. L. Black, president, Inland Steel Co., and **C. C. Jarchow,** president, American Steel Foundries, have been elected to the board of trustees, Illinois Institute of Technology. Both have been active in the industry and civic affairs for many years.

J. R. Gregory has been appointed Pacific Coast sales representative for National Bearing Division, American Brake Shoe Co. He is former vice-president of sales and director, Geneva Steel Co., and will be located at San Mateo, Calif.

continued on page 30

Foundrymen in the News

continued from page 28

E. J. Fanton and **H. N. Patronik** have joined the engineering staff of the Dust Control Dept., Pangborn Corp., Hagerstown, Md. **Mr. Fanton** was born and educated in England, while **Mr. Patronik** is from the Chicago area, where he was formerly with Whiting Corp. in dust control work.

Arthur Kuiper, treasurer, Continental Foundry & Machine Co., East Chicago, Ind., has been elected to the board of directors, succeeding **W. B. Todd,** who retired last year. Continental has also appointed Don Watkins as a vice-president, with headquarters at the Pittsburgh (Pa.) offices.

W. J. Bulman has joined the staff of National Foundry Association, Chicago, as assistant to the executive secretary. A graduate of Seton Hall University, **Bulman** has also studied law at Syracuse and Fordham universities, and spent three years with the Federal Bureau of Investigation.

Macedonio Zanetta L., manager of foundries, La Cantabrica, Buenos Aires, Argentina, is visiting U. S. foundries during April, May, June, to study production of agricultural equipment, rolls, ingot molds, and to investigate shell molding and nodular iron.

R. J. O'Neil has been appointed a field engineer by Norton Co., Worcester, Mass., and will be assigned to the Detroit office. He served five years in the Royal Canadian Air Force during World War II.

J. T. Sherman has been named head, metals process section, sales department, Chemical Construction Corp. A 1931 graduate of M.I.T., **Mr. Sherman** will be charged with negotiating agreements on the installation of plants to utilize the firm's metals recovery methods.

E. J. Fanton . . . dust control

H. N. Patronik . . . with Pangborn

A. L. Kinkade has joined the sales force of Great Lakes Foundry Sand Co., Detroit. Schooled at University of Indiana, he has been in purchasing and sales in the foundry industry since 1940.

Carborundum Co. has made **F. J. Tone, Jr.,** senior vice-president, and **F. T. Keeler,** director of sales.

Dr. W. J. Harris has joined the staff of Battelle Memorial Institute, Columbus, Ohio, as a consulting scientist. He came from Washington, D. C., where he held several high posts.

American Wheelabrator & Eqpt. Corp., Mishawaka, Ind., announces several promotions and additions in its field sales and service staff. **W. A. Illsley** was promoted to district sales engineer at the Detroit office. At Springfield, Mass., **W. J. Sutherland** was named district sales engineer, and **J. H. Burlingame** was appointed service engineer. At Cleveland, **C. J. Osborn** was moved up to district sales engineer, and **D. T. Pournaras** became district service engineer. **J. J. Savignac** is a new district service engineer at the Milwaukee office. **R. E. Gallatin** was appointed district sales engineer at the Mishawaka, Ind., office, as was **Harold Groh.**

C. T. Olsen is now sales engineer at Acheson Colloids Co., Port Huron, Mich. He was formerly with Hanson-Van Winkle-Munning Co., and Automotive Rubber Co. as electro-chemist and sales engineer, respectively.

C. T. Olsen . . . Acheson sales

O. S. Stewart, formerly president, Cleveland Metal Abrasive Co., Cleveland, has been elected chairman of the board. His son, **R. J. Stewart,** former vice-president, has been elected to succeed him.

J. T. Sherman . . . process sales

O. S. Stewart . . . board chairman

R. J. Stewart . . . new president

For Permanent Mold Castings

A complete line of

LINDBERG FISHER

ALUMINUM MELTING and HOLDING FURNACES

Lindberg-Fisher manufactures all types of Aluminum Melting and Holding Furnaces for permanent mold application—Gas-Oil-Electric resistance.

Lindberg-Fisher engineers can intelligently recommend the type of furnace to best suit your needs and conditions.

Melting specialists for 25 years
Sales and service offices in principal cities

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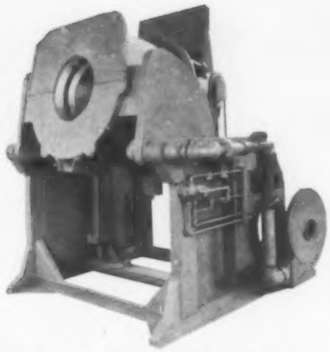
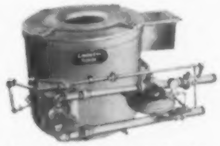
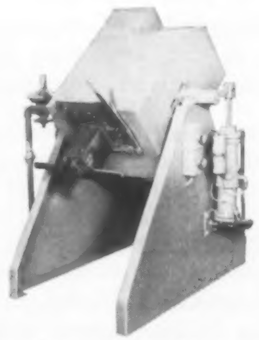


Lindberg-Fisher type HNP Hydraulic Nose-Pour Tilting Crucible Furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 57-A.



Lindberg-Fisher type ADC Aluminum Melting and Holding Furnace. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 301.

Lindberg-Fisher Electric Resistance Aluminum Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities up to 1000 lbs. of aluminum.



Lindberg-Wessel Casting Machine produces quality aluminum castings on a semi-automatic basis using either graphite or steel molds which are attached to the machine. Described in Bulletin LW.

You Get Greater Flexibility Without Costly Installations When You MECHANIZE MATERIALS HANDLING With Tractor Shovels

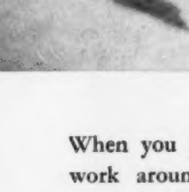
When you put an Allis-Chalmers Tractor Shovel to work around your plant, it starts paying its way immediately. There is no down time for installation or costly plant alteration . . . no long training course for the operator. What's more, this one-operator machine not only saves many man hours, it gives you the benefit of several specialized units in one.

As Materials Handlers, Allis-Chalmers Tractor Shovels, with capacities from one to four cubic yards, pick up and carry all types of bulk, solid or packaged loads and deliver them anywhere in or around the plant. Storage areas may be changed at will. Special attachments — Lift Forks, Rock Forks, Bulldozers and Angledozers plus many others for some models — may be interchanged with the bucket in about 20 minutes.

As Prime Movers, these powerful crawler tractors can pull, lift or skid heavy machinery, spot railroad cars at loading docks. Traction and flotation enable these machines to work in snow or mud where wheel-mounted equipment bogs down.

As Maintenance and Construction Machines, Allis-Chalmers Tractor Shovels handle general clean-up work around the plant, build plant roads, excavate for new construction, clear snow . . . keep busy repaying your investment winter and summer.

Ask your Allis-Chalmers dealer to show you how the versatile Tractor Shovel is helping cut costs for thousands of owners. There are four sizes to fit your needs from the one-yard HD-5G to the four-yard HD-20G with torque converter drive.



Write for catalog describing the use of tractors in modern materials handling.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

This metal will be ROCKED and SPUN to make a better casting

Detroit Electric Furnaces melt both ferrous and nonferrous alloys at Shenango's Centrifugal Casting Division, Dover, Ohio.

Six Detroit Rocking Electric Furnaces melt alloys for huge centrifugally cast sleeves, rings and fabric rolls at Shenango-Penn Mold Company. These fast melting Detroit Furnaces achieve the close control of temperature and metal analysis required, producing better centrifugal castings with fewer rejects.

Indirect arc melting and controlled rocking action produce finer, more uniform melt results. Electrodes are always clear of the molten metal, holding alloy variation and carbon pickup to a minimum. Rocking action assures homogeneity of the metal and washes it over more refractory surface for greater heat utilization, longer refractory life.

The versatile Detroit Rocking Electric Furnace melts ferrous or nonferrous metals with speed and economy. Send us your melting requirements and our engineers will show you how "Detroit's" can do a better melting job for you. Write today!

DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

HOW TO PUT THE SQUEEZE ON BLAST CLEANING COSTS

. . . ***USE MALLEABRASIVE, SHOT OR GRIT.*** Scientifically heat-treated for durability, Malleabrasive lasts longer. Laboratory controlled for strength and consistency, Malleabrasive cleans better faster. And because it does a better job in less time with fewer refills, Malleabrasive cleans *cheaper!* See for yourself. Next time you order blast cleaning abrasive, specify Malleabrasive from Pangborn Corp., 1300 Pangborn Blvd., Hagerstown, Maryland.

Pangborn DISTRIBUTORS FOR

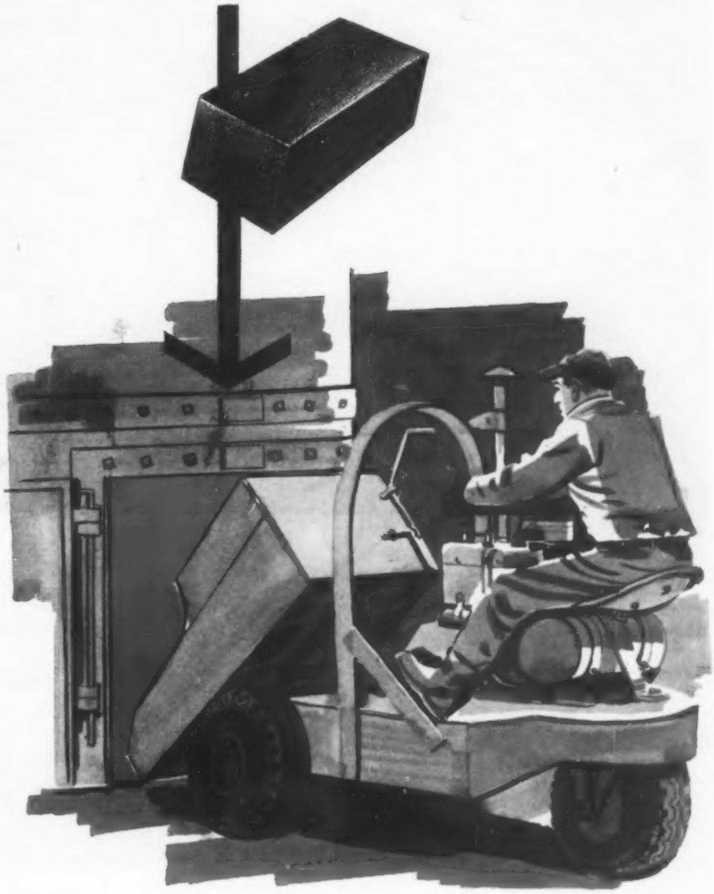
MALLEABRASIVE®

PANGBORN'S 50th ANNIVERSARY—1904-1954

U. S. Patent # 2184926
(other patents pending)

the same results at lower cost with—

MEXITE®



Mexite briquettes, composed of 70% graphitic carbon, provide foundrymen with a positive method of raising and stabilizing the carbon content of cupola charges and at the same time reduce the cost. Larger amounts of scrap can be used with resultant savings in charging costs. For example, if 400 lbs. additional scrap is charged, four Mexite briquettes will retain the same carbon analysis at a savings of $3.06* per ton of charge.

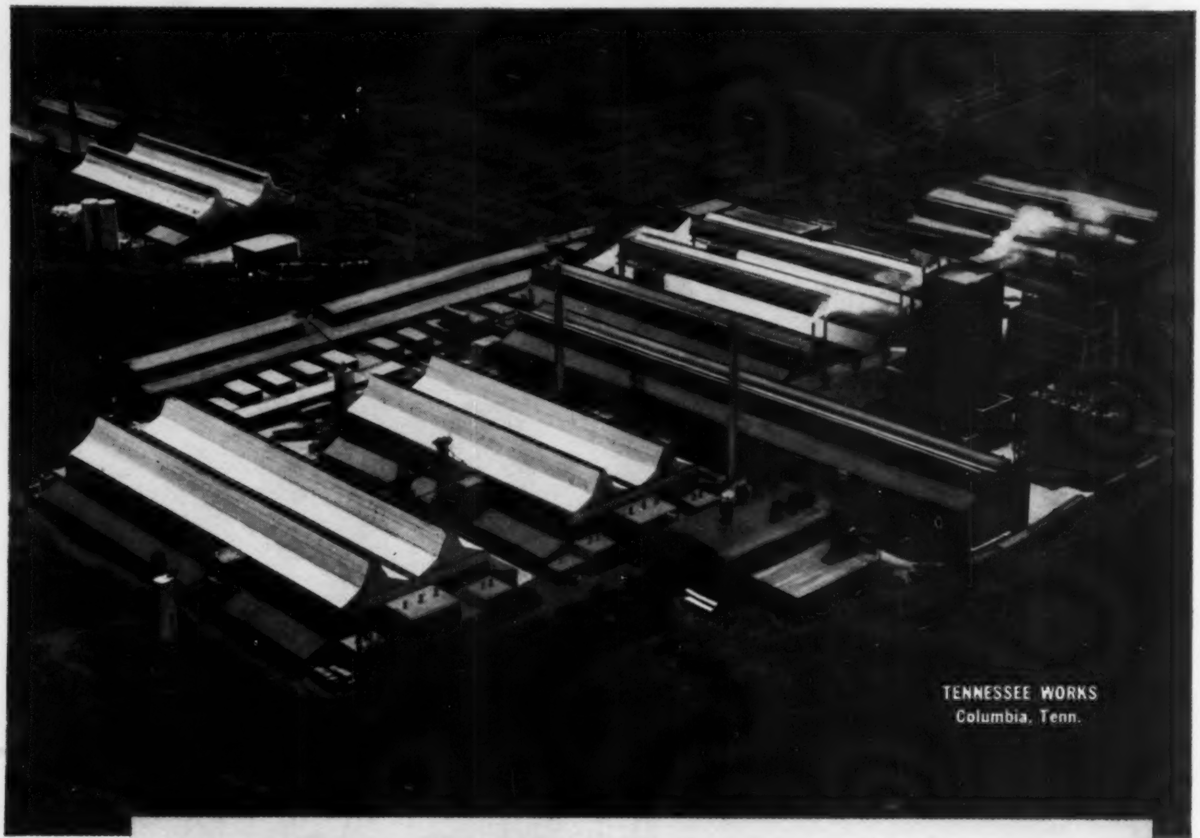
Mexite briquettes help produce better castings because they permit accurate carbon control. Mexite helps assure lower chill and hardness, and provides better fluidity and machinability thus increasing useable metal yield and cutting scrap loss. Mexite briquettes are packed 90 lbs. to a carton for easy handling and storing. We'd like to show you what Mexite can do in your foundry . . . write us today for a specific recommendation made for your particular area. We'll also send along our newest bulletin that will show you how Mexite can help keep your costs down where you want them to be.

** Based on average current pig iron and scrap prices*

OUR 100th YEAR

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN



FIVE REASONS WHY NATIONAL CARBON COMPANY ELECTRIC FURNACE ELECTRODES GIVE YOU THE MOST FOR YOUR MONEY...

ELECTRODE QUALITY... has a direct bearing on the quality of *your* product; in many instances, it can materially affect your *cost.* National Carbon's graphite and carbon electrodes are, and always have been, the finest quality obtainable *anywhere.* We make this statement without reservation.

NEW PRODUCT DEVELOPMENT... is basic in technological progress. National Carbon has *always* done the major part of this country's electrode research and development... a share out of all proportion even to its outstanding leadership in the production and sale of these products. This is a matter of long-standing record.

PLANT CAPACITY . . . National Carbon's ability to *produce* is at an all-time high. The five plants shown here are fully integrated for production of both carbon *and* graphite electrode products — a situation rare in the industry and in keeping with National Carbon's far-sighted planning to pace requirements of a rapidly-expanding economy. For example, plant additions in the last five years alone have more than doubled graphite electrode capacity.

EXPERIENCE . . . of National Carbon is the foundation, building blocks and cornerstone of electrode-products manufacture in this country. First with commercial production of both carbon and graphite electrodes in the early 1900's, National Carbon introduced the first of each increasingly larger electrode size from that time to the present, plus a host of successful accessory items for improved application of electrodes in the metallurgical field. Today, National Carbon is the only company producing carbon electrodes up to 45" diameter; graphite electrodes to 35". Even larger electrodes and other massive shapes can be made with present facilities. Inquiries are invited.

RESPONSIBILITY . . . to customers and to the industry as a whole . . . expresses itself several ways in National Carbon history. The company has consistently kept ahead of demands for both quality and size of electrode products; National Carbon research stands virtually alone in the steady march of new product development; and, in the field of *service,* National Carbon is supreme. For many years we have conducted an expanding, electrode technical-service operation, staffed by a group of electrode experts, specially trained to help you get ***more for your electrode dollar.***

The terms "National" and "Acheson" are registered trade-marks of Union Carbide and Carbon Corporation

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A Division of Union Carbide and Carbon Corporation
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Talk of the Industry

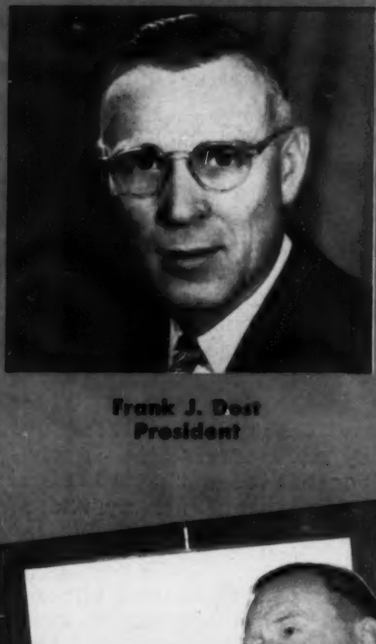
LOSING BUSINESS is to your advantage if the job is not carrying its share of operating cost and profit, according to Carl E. Rowe, consultant, speaking before a regional meeting of the National Foundry Association. Such a job should be replaced with profitable production. A complete analysis should be made of the profitability of each product, based on operating costs. Internal costs should be reduced or sales price should be increased to make each job stand on its own merit.

MECHANIZATION is the key to remaining competitive, C. V. Nass, vice-president, Pettibone Mulliken Corp., and general manager, Beardsley & Piper Div., told members of the AFS Chicago Chapter at their annual business meeting. The entire plant doesn't have to be mechanized at the same time, but every step--no matter how small--must be part of an over-all plan for mechanization.

BUSINESS CAN HELP ACHIEVE GREATER ECONOMIC STABILITY, according to the Committee for Economic Development, by the suggestions below, which are listed among a number in the CED 50-page report, "Defense Against Recession:" (1) Business should exploit fully the potentialities of research in the development of new products and improved production methods; (2) Businesses should be constantly alert and vigorous to improve their marketing methods, to make sure that the consumer is well informed and efficiently served, and that the producer is aware of potential markets. A revival of attention to selling is now required, after neglect in the war and postwar period; (3) If sales decline, businesses should not automatically cut selling effort and advertising budgets, as they have often done in the past. They should appraise the possibilities that will exist for maintaining sales by redoubled effort in an economy where incomes and savings will still be large.

RECRYSTALLIZATION is of keen practical and theoretical interest to foundrymen because it is the major internal process occurring in the course of annealing of metals. Although the precise nature of the phenomenon is not definitely known, it has long been felt that growth of grains in metals coalescence proceeded much the same as in liquids, with the oft-repeated analogy between grain structure and bubble shapes in foam. There is some evidence, however, that when two grains of metal coalesce, the end volume is much greater than the sum because growth continues by geometrical progression until resulting volume is about nine times the original. When two bubbles coalesce in a liquid, the resulting volume is simply the sum of the two original volumes. This new "geometrical coalescence" concept postulates that solid grains under certain conditions absorb atoms from neighboring grains to keep volumes symmetrical. Complete validation of this theory would open up new avenues in grain-growth investigation, with tremendous potential advantage to the metals producing industries.

Convention NEWS Story



Frank J. Dost
President

Bruce L. Simpson
Vice-President

AFS President Collins L. Carter (1953-54) (at podium and inset) addresses Annual Business Meeting at 58th Convention.

APPROXIMATELY 15,000 foundrymen attended the 58th annual Convention and Exhibit of American Foundrymen's Society at Cleveland, May 8-14, 1954. National President Collins L. Carter presided over the week-long activities, which attracted foundrymen from the Americas, from Europe, and from other overseas areas.

Activities were centered at the Cleveland Public Auditorium, which housed the largest showing of foundry machinery and equipment in the history of the event. Most of the technical sessions were also held there, with others at the Hotels Cleveland, Statler, and Hollenden.

One of the most dramatic moments of the Convention came during the banquet, top social event of the AFS Annual Meeting, when President Carter announced that the Pangborn Foundation, through Thomas W. Pangborn, president, Pangborn Corp., Hagerstown, Md., had granted the Society $50,000 for educational purposes. Object is to set up undergraduate scholarships to be administered through AFS chapters.

Opening on Monday, May 10, the technical program was concentrated into five days, featuring 43 technical sessions, eight round table luncheons, and ten shop course meetings. More than 90 formal technical papers were presented, along with committee reports, symposia, panel and audience discussion meetings, and motion pictures. Authors and speakers represented every phase of the metals casting industry: research, metallurgy, education, management, plant engineering, patternmaking, and suppliers to the foundry field. Concurrently, 16 divisional and committee meetings were held by AFS groups.

One of the highlights of the technical program was the presentation of the Charles Edgar Hoyt Annual Lecture by H. W. Dietert, Harry W. Dietert Co., Detroit. Five international papers were on the schedule, including official exchange papers from the Institute of British Foundrymen; Institute of British Foundrymen, Victoria Branch; and Institute of Australian Foundrymen, New South Wales Division.

The biennial AFS Foundry Show was displayed in the six halls of the spacious Cleveland Public Auditorium, where 310 exhibitors used more than 100,000 sq ft of floor space. Over $3 million worth of foundry

Some of the 15,000 foundrymen who attended the 58th Annual AFS Convention and Exhibit at Cleveland, May 8-14.

More than 900 foundrymen and their ladies attended the annual banquet, held in the Public Auditorium on the evening of May 12. Following presentation of gold medal awards and honorary life memberships, a six-act revue entertained the audience. Surprise of the evening was the announcement by President Carter of the $50,000 scholarship endowment to AFS by the Pangborn Foundation.

equipment was shown during the week. Many companies featured working exhibits, showing their machinery under operating conditions.

Foundrymen saw the product of our industrial genius, geared to the task of aiding the metals caster to turn out the highest quality castings, with closest adherence to specifications, at the lowest commensurable cost. Molding machines, shake-out units, furnaces and melting equipment, conveyors, sand conditioning and handling machinery, test and laboratory gear, were all on display during the six-day showing. In addition, many organizations servicing the foundry industry operated booths at Cleveland.

The Exhibit, which did not open officially until May 10, presented a special preview showing on Saturday, May 8, designated Northeastern Ohio Day. Attendance was largely composed of personnel affiliated with foundries in the immediate vicinity of Cleveland.

The Annual Business Meeting of the Society was held in the Auditorium ballroom on Wednesday, May 12, with National President Collins L. Carter presiding. In his President's message, Mr. Carter said that in his two years as an officer of AFS he has been amazed by the interest and cooperation shown by the members of the Society, most manifest in the work of technical committees. These are the groups that implement the purposes of AFS: to disseminate technical information on a bilateral basis throughout the metals casting industry, to further education in the field, and to sponsor research projects that will add to the body of scientific data available to foundrymen.

Mr. Carter particularly emphasized the need for "new blood" in AFS committee work, and urged

This panel was featured at a Malleable shop course session. From left: L. R. Jenkins, Wagner Malleable Iron Co.; vice-chairman William Zeunik, National Malleable & Steel Castings Co.; chairman Eric Welander, John Deere Malleable Works; J. T. Bryce, Albion Malleable Iron Co.; and F. W. Jacobs, Texas Foundries, Inc.

management to encourage activity in this direction.

The past year, Carter said, has seen many changes in the Society, but the next five years will witness a tremendous growth within the AFS structure. Membership reached an all-time high of 11,600 on April 1, 1954, but a minimum of 15,000 is considered the target figure.

Carter thanked all those individuals, companies, local chapters, and other segments of the foundry industry that have contributed $235,000 to the building fund for the new AFS headquarters in Des Plaines, Ill. He announced that the building would be ready for occupancy by August of this year.

While AFS has lived within its income during the past several years, Carter recommended a study by the Board, looking toward a halt to all fund solicitations in the future. Expectation is that the Society will operate on a business basis, within the scope of its annual income derived from regular activities.

American Foundryman, Carter announced, has been reorganized as a separate division of the Society (page 90), and would operate within its own financial organization with a single head in charge of both editorial and advertising.

In accordance with the newly-revised by-laws of the Society, the new officers and directors (page 51) were declared elected unanimously and introduced by AFS Secretary-Treasurer Wm. W. Maloney.

New President for the 1954-55 term is Frank J. Dost, Sterling Foundry Co., Wellington, Ohio. Bruce L. Simpson, National Engineering Co., Chicago, was elected Vice-President.

After the introduction of officers and directors, incumbent President Carter announced the results of the AFS Apprentice Contest (page 88), and presented prizes to the first-place winners in each of the five divisions.

Following the Annual Business Meeting, the Charles

AFS Past-President F. J. Walls (1945-46) presents gold medal to R. A. Gezelius. Other medalists watching are T. E. Eagan (second from right), and W. E. Sicha.

Mr. Walls hands honorary life membership certificate to retiring AFS President Carter. Others also honored are L. P. Robinson (second from left) and E. M. Strick.

Convention **NEWS** *Story*

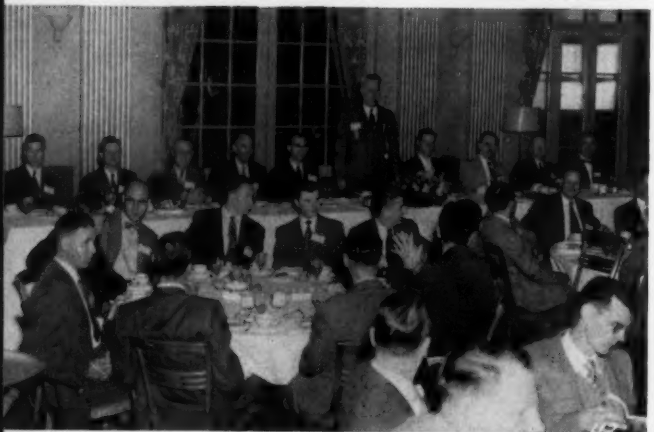
Edgar Hoyt Annual Lecture was presented by H. W. Dietert, chairman of the board, Harry W. Dietert Co., Detroit. Speaking on *"Processing Molding Sands,"* Mr. Dietert discussed the handling of raw materials for the production of molding sands with desirable properties for high quality castings. He stressed the selection of proper sand grain characteristics for various foundry applications, then reviewed mixing and conditioning methods. The effect of additives on hot properties of sands was treated in detail.

Mr. Dietert also presented valuable data on bonding, moisture control, aeration, ramming practice, and the reclamation of foundry sands.

Sand processing and control have progressed through three stages, Mr. Dietert declared. Stage one started about 1920, when serious sand testing commenced. About ten years later, when foundries turned toward finer sands and markedly increased their use of machine molding, stage two began. Today, we are entering stage three, the speaker stated, an era of automatic sand control when machines will keep sand within a predetermined range of properties.

Usable molding materials, listed by Mr. Dietert in order of decreasing expansion characteristics, were silica, olivine, mullite, chamotte, coke, and zircon. He suggested that foundrymen consider using mixtures of some of these for solving special mold problems. Reviewing fundamentals of sand property changes, the speaker pointed out that a 10 per cent addition of fines reduces permeability up to 50 per cent, while a 30-40 per cent addition of coarse sand is required to show only a slight increase in permeability. To avoid scabbing, he recommended low hot strength if hot expansion is high or low expansion if hot strength is high. Referring to the wide variety of sand additives available, he stated that foundrymen can be the masters of hot properties of molding sand.

While sand control in the past has been concentrated on mechanical properties, the trend today is toward chemical control with pH receiving considerable attention, Dietert said. Sand should be worked at relatively high strengths, such as 10 psi green compression, with controlled deformation. He showed how the



(Top left) Shown at Pattern Round Table Luncheon, seated, from left: F. C. Cech, Cleveland Trade School; V. J. Sedlon, Master Pattern Col.; Vaughan Reid, City Pattern Foundry & Machine Co.; and H. J. Jacobson, Industrial Pattern Works, Vice-Chairman. Standing, from left: A. F. Pfeiffer, Allis-Chalmers Mfg. Co., presiding; George Webber, Webber Gage Co.; E. T. Kindt, Kindt-Collins Co.; J. W. Costello, American Hoist & Derrick Co.; and L. F. Tucker, City Pattern & Foundry Co. (Left center) At speakers' table at Light Metals Round Table Luncheon, from left: K. Grube and J. G. Kura, Battelle Memorial Institute; F. J. Dost, AFS President-elect; H. J. Heine, AFS Technical Director; R. F. Thomson, Vice-Chairman, General Motors Research Laboratories; Chairman W. E. Sicha, Aluminum Co. of America; D. G. McCullough, General Motors Research; J. G. Mezoff, Dow Chemical Co.; J. D. Stay, Reynolds Metals Co.; and C. E. Nelson, Dow Chemical Co. (Bottom left) This Pattern Session panel includes, from left: F. G. Sefing, International Nickel Co.; Earl Strick, Erie Malleable Iron Co.; H. E. Mandel, Pennsylvania Foundry Supply & Sand Co.; R. M. Reese, Supervisor of Trade & Industrial Education, State of Ohio; A. B. Sinnett, AFS Headquarters; and B. C. Yearley, National Malleable & Steel Castings Co.

hand-feel method of estimating the condition of a molding sand has some scientific basis, but doesn't enable properties to be expressed numerically. Explaining automatic moisture control, he told how electronic equipment can determine and add the necessary base water for tempering and the evaporative water needed to compensate for vapor loss.

At the conclusion of the Hoyt Lecture, the chairman of the Annual Lecture Committee, H. Bornstein, presented Mr. Dietert with a commemorative certificate and a hunting rifle.

The President's Reception and International Reunion were held jointly on Monday, May 10, in the ballroom of the Hotel Cleveland. In addition to AFS officials and those of the Northeastern Ohio host chapter, all foundrymen who had attended the International Foundry Congress at Paris in 1953 were invited.

One of the climactic events of Convention week was the Annual Banquet, held in the ballroom of the Public Auditorium, with National President Collins L. Carter presiding. The banquet group of 900 heard the introduction of the six men honored by AFS for outstanding achievement.

Perpetuating the traditions of the Society, three Gold Medals were awarded for distinguished service. Walter E. Sicha, chief, Cleveland Research Div., Aluminum Co. of America, received the William H. McFadden Gold Medal, "for extensive and valuable work on light metals casting alloys and for outstanding contributions to the Society."

The Peter L. Simpson Gold Medal was awarded to Roy A. Gezelius, works manager, General Steel Castings Corp., Eddystone, Pa., who was cited "for outstanding contributions to the steel casting industry, particularly with reference to the development and production of cast armor plate."

Thomas E. Eagan, chief research metallurgist, Cooper-Bessemer Corp., Grove City, Pa., was the recipient of the Joseph S. Seaman Gold Medal. He was honored "for outstanding work in the development and dissemination of engineering data on the production and utilization of alloy cast irons."

Honorary Life Memberships in AFS were awarded to: Leroy P. Robinson, vice-president, Foundry Div., Archer-Daniels-Midland Co., Cleveland, "for outstanding and long-sustained service to the Society and its Chapters, and for singular contributions to the im-

President Carter congratulates first-place winners of AFS Apprentice Contest. From left: Steve A. Simon, Jr., wood pattern; Herbert J. Tidick, metal pattern; Robert J. Luckenbill, steel molding; Donald R. Tetzlaff, non-ferrous molding; and William E. Morehead, gray iron molding.

The official AFS Tea was the occasion for this group. From left: Mesdames R. D. Walter, F. Ray Fleig, F. J. Dost, W. L. Seelbach, A. D. Barczak, S. E. Kelly, C. L. Carter, Edwin Bremer and E. Claude Jeter. Mrs. David Clark, Jr. is pouring.

Speakers' table at Brass and Bronze round table luncheon. From left: M. G. Dietl, Schaible Co.; R. B. Fisher, Ingersoll-Rand Co.; F. L. Riddell, H. Kramer & Co.; B. N. Ames, Doran Manganese Bronze Co.; B. A. Miller, Crown Non-Ferrous Foundry, Inc.; H. L. Smith, Federated Metals Div., American Smelting & Refining Co.; H. M. St. John, Crane Co.; H. C. Ahl, Jr., Down River Casting Co.; H. J. Roast, foundry consultant.

This panel headed Malleable division session. From left: H. C. Stone, Belle City Malleable Iron Co.; W. K. Bock, National Malleable & Steel Castings Co.; R. B. Osborne (standing), Lakeside Malleable Castings Co.; and F. B. Rote, Albion Malleable Iron Co.

(Above) R. F. Dalton, Hills-McCanna Co., speaks before Plaster Mold Casting session. Others, seated, from left: C. R. Gardner, Cleveland Research Div., Aluminum Co. of America; H. Rosenthal, Pitman-Dunn Laboratories, Frankford Arsenal; K. A. Miericke, Baroid Sales Div., National Lead Co.; and O. H. Harer, Scientific Cast Prods. Corp. (Below left) AFS officials, guests, and international visitors met at the President's Reception. (Below right) This Bakelite Co. booth drew many interested spectators, as did all of the 310 exhibitors who occupied more than 100,000 sq ft of floor space in the largest show in the history of the event, which dates to 1906.

provement of foundry core room practice;" to Earl M. Strick, finishing superintendent, Erie Malleable Iron Co., Erie, Pa., "for outstanding work in the development and encouragement of foundry interest at the high school and trade school level through the medium of local Chapters;" and, to Collins L. Carter, president, Albion, Malleable Iron Co., Albion, Mich., "on completion of his term of office as President of American Foundrymen's Society."

After the awards presentations, the banquet audience was entertained by a top-flight, six-act, variety revue. With Jack Herbert as master of ceremonies and music by the orchestra of Al Berardi, the show featured long-time Broadway favorite, Will Mahoney. Other acts were the Six Vocalovelies; Pryde and Day, juggling unicycle acrobats; singers Inez and Gordon; international dancing stars Bev and Jack Palmer; and the Hermit Singers, a 30-man glee club.

The show was arranged and produced by the Leo Fredericks booking agency, Cleveland. The banquet dinner was catered by the Hotel Statler organization.

AFS members from Canada, and their ladies, gathered for the annual Canadian Dinner in the Hotel Cleveland ballroom on Tuesday, May 11. Na-

tional Director G. Ewing Tait, Dominion Engineering Works, Lachine, Que., Canada, presided at the dinner, which has a long tradition of cordiality and friendly spirit.

President Carter complimented Canadian foundrymen on their enthusiastic participation in the Convention. The three Canadian Chapters, he declared, are one of the bulwarks of the Society. Secretary-Treasurer Maloney announced that the dinner was the largest Convention gathering of Canadians with over 240 present. Vice-President Dost paid tribute to past national directors from Canada and called for a period of silence in respect to the late E. N. Delahant. In closing, National Director Tait suggested that more Canadians participate in technical committee activities and urged everyone to put at least one idea gained during the Convention to work in the coming year.

Former Presidents of the Society held their Past Presidents' Breakfast on the morning of Thursday, May 13, at the Hotel Statler. Presiding was W. L. Seelbach (1951-52), Superior Foundry, Inc., Cleveland.

The annual Alumni Dinner was held at the Union Club on Thursday, May 13. Chairman for the evening was I. R. Wagner, Past AFS President (1952-53), Electric Steel Castings Co., Indianapolis. Former and present officers and directors, medalists, and honorary life members comprised the attendance.

As in the past, other organizations associated with the industry held meetings during the week. Non-Ferrous Founders' Society staged its annual dinner-meeting, preceded by a reception, in the ballroom of the Carter Hotel, Monday, May 10. National Foundry Association convened its administrative council at the Hotel Cleveland, Thursday, May 13, for its semi-annual business session. National Castings Council met at the Cleveland Athletic Club on Wednesday, May 12, to elect officers and handle other business (page 100).

Foundry Equipment Manufacturers' Association held a series of meetings during the week, including a board of directors breakfast and meeting, a reception, and several group sessions.

A board of trustees luncheon and meeting was held by Foundry Educational Foundation at the Hotel Cleveland on Thursday morning, May 13.

The entertainment program for the ladies attending the Convention was arranged by a committee of the Northeastern Ohio Chapter, headed by Mrs. Stephen E. Kelly, chairman; and Mrs. David Clark, Jr., vice-chairman. Events included the Official AFS Tea in the Hotel Cleveland, luncheon and floor show at the Alpine Village, and a special luncheon and program at the Westwood Country Club. Many of the ladies also attended the Annual AFS Banquet on Wednesday, May 12.

Fifteen Cleveland-area foundries and pattern shops participated in the week-long plant visitations program. Ford Motor Company's Cleveland Foundry opened its facilities to Convention visitors on Friday, May 14, with a morning and an afternoon tour. Other plants cooperating in the program offered a diversified grouping of working foundries and pattern shops,

continued on page 102

H. Bornstein presents hunting rifle to H. W. Dietert, following his delivery of the Charles Edgar Hoyt Annual Lecture.

This trio attended the Annual Canadian Dinner. Left to right: Alex G. Storie, G. Ewing Tait, and Joseph Sully.

Some 15,000 foundrymen attended the 1954 AFS Exhibit.

Eugene R. Oeschger

W. M. Hamilton

Frank C. Cech

William A. Morley

W. R. Pindell

J. T. Westwood, Jr.

AFS Officers and Directors

NEW officers and directors of American Foundrymen's Society were elected at the Annual Business Meeting, held May 12, during the Convention at Cleveland.

President

Frank J. Dost, president, Sterling Foundry Co., Wellington, Ohio, was elected President of AFS for the 1954-55 term. Born in Brooklyn, educated in engineering at University of Cincinnati, he became a student apprentice in the foundry of Cincinnati Milling Machine Co. in 1926. From 1929-33, he was engaged in alloy cast iron development as foundry engineer, Williams & Co., Inc., Cincinnati and Cleveland. He has been with Sterling Foundry Co. since 1933, was elected president of the firm in 1952.

Vice-President

Bruce L. Simpson, president, National Engineering Co., Chicago, became the new AFS Vice-President at the Annual Business Meeting. He attended Hobart College, Geneva, N. Y., received a degree from Northwestern University in 1934, and an LL.B. from the same school in 1936. He was admitted to the bar in 1937. Simpson became active in the foundry field as purchasing agent for National Engineering Co., later was appointed vice-president, then president in 1942. He has been a director of F.E.M.A., and has held several offices with Chicago AFS Chapter.

Directors, Three Years

William A. Morley, Foundry superintendent, Olney Foundry Div., Link-Belt Co., Philadelphia, has served his entire foundry career with the Link-Belt Co., beginning in Chicago in 1929. He has advanced from patternmaker to his present position, which he has held since 1944. Mr. Morley studied business administration and metallurgy at Northwestern University and Illinois Institute of Technology.

Frank C. Cech was born in Vienna, Austria but received his education in Ohio schools. He began his patternmaking career in Cleveland with American Steel & Wire Co., and held similar positions with Wellman, Searer & Morgan Engineering Co., and Corrigan McKinney Steel Co., both of Cleveland. He was assistant foreman at Cleveland Automatic Machine Co., and pattern shop foreman for Allyne-Ryan Foundry Co., Cleveland. Mr.

C. B. Schneible

L. H. Durdin

C. E. Brust

Cech has been affiliated with Cleveland Trade School for 24 years, is now head of the patternmaking division.

W. M. Hamilton, manager, Crane Co., Chattanooga (Tenn.) Div., was born in Scotland and educated in Montreal, Canada, where he attended Montreal Technical Institute. Before his present affiliation, Mr. Hamilton served an apprenticeship with Allis-Chalmers Mfg. Co. in Lachine, Que. and was a patternmaker for Dominion Engineering Co., also of Lachine. He had a long managerial career with various firms before joining Crane Co. in 1947.

B. George Emmett, works manager, Los Angeles Steel Casting Co., Los Angeles, began his foundry career as molder, Emmett & Sons, Los Angeles, in 1920. He joined his present firm in 1924 and has advanced through molder, foreman, and superintendent, to his current position, which he has held since 1940. He was president of the AFS Southern California Chapter in 1940-41.

Harold L. Ullrich, manufacturers' representative, Livingston, N. J., graduated from Pace Institute, New York. He was works manager, Sacks Barlow Foundries, Inc., Newark N. J. from 1926-1954. Active in AFS since 1937, he has been chairman of the Metropolitan Chapter, 1946; a director of that chapter; and was general chairman of the East Coast Regional Conference in 1947.

Eugene R. Oeschger, general manager, Foundry Dept., General Electric Co., Schenectady, N. Y., graduated from Rochester Institute of Technology in 1924. He spent the next 24 years with Symington-Gould Corp., Rochester, N. Y., serving variously as draftsman, production engineer, and works manager. He became associated with General Electric in 1948, was advanced to his present post in 1949.

Harold L. Ullrich

B. G. Emmett

Director, Two Years

William R. Pindell, vice-president and general manager, Northwest Foundry & Furnace Co., Portland, Ore., was born in Seattle, Wash., and attended Reed College. He has been with his firm since 1934, comprising all of his foundry career. Mr. Pindell was chairman of the Oregon Chapter of AFS.

Directors, One Year

J. T. Westwood, Jr., president, Blue Valley Foundry Co., Kansas City, Mo., is also president, Harrisonville Foundry, Harrisonville, Mo. He started with Blue Valley in 1930, spent four years, 1935-39, as foundry superintendent at Cushman Foundry, Lincoln, Neb., then rejoined his present company. He was appointed president in 1942.

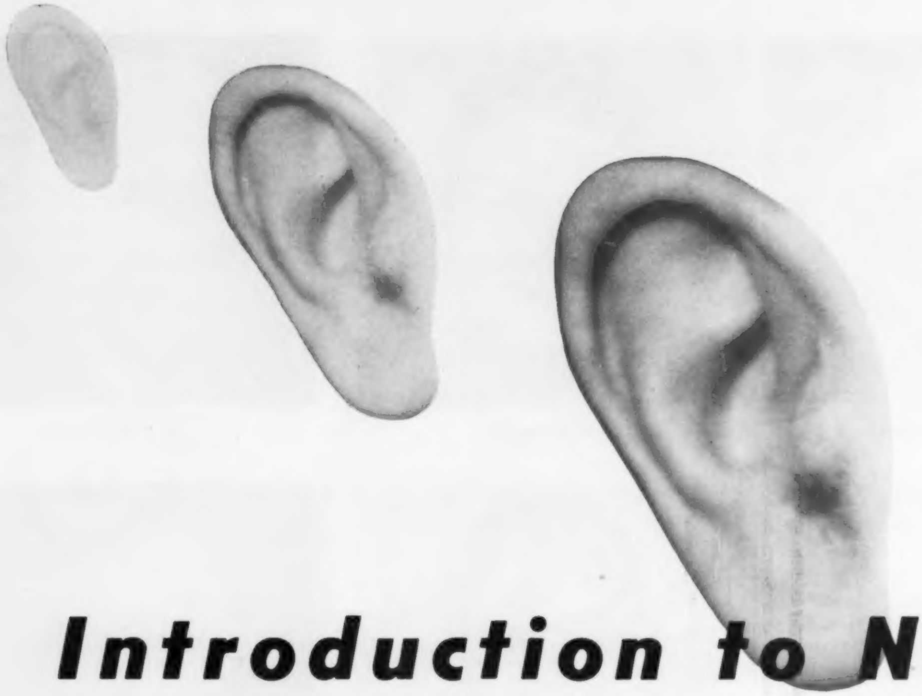
Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich., will serve for one-year as Director upon completion of his 1953-54 term as President of AFS, as provided in the bylaws.

Elected by Board

(One Year) **Claude B. Schneible,** president, Claude B. Schneible Co., Detroit, attended Northwestern University, then worked as draftsman, assistant to the works manager, as a salesman in the foundry field until 1934, when he formed his own company in Chicago, later moving to Detroit. Mr. Schneible is a past-president both of F. E. F. and F. E. M. A.

(Two Years) **Charles E. Brust,** president, Eastern Malleable Iron Co., Naugatuck, Conn., joined his present firm upon graduation from Troy (N. Y.) Business College in 1911. He has been successively treasurer, secretary, managing director of Eberhard Mfg. Co. Div., vice-president, executive vice-president, and now president. Mr. Brust was vice-president of Malleable Founders' Society in 1953-54.

(Three Years) **L. H. Durdin,** president, Dixie Bronze Co., Birmingham, Ala., is a Chicago native who graduated from University of Illinois in 1929, and from Babson Institute, Boston, in 1930. He was purchasing agent for Chicago Pump Co., 1930-40; superintendent, Jay Mfg. Co., 1940-42; and plant manager, Line Material Co., Birmingham, until 1946, when he joined Dixie Bronze Co. In addition to his AFS activities, Mr. Durdin is a past-president of Non-Ferrous Founders' Society and a member of A. I. S. E.



Introduction to Noise

JOHN O. KRAEHENBUEHL / *Prof., Electrical Engineering, Univ. of Illinois*

Efficiency and production go up, absenteeism goes down, when noise is controlled. What noise is and what foundrymen can do about it is outlined in this paper taken from the recently-published *Symposium on Safety, Health, and Air Pollution*.

▪ Sound has two distinct elements of interest to the individual concerned with industrial problems. As regards the physiology and psychology of the individual, the interest is to produce an atmosphere in which the worker will expend the least amount of nervous energy so that he can produce in comfort and without deleterious effect on the human mechanism. As to the noise element itself, the works manager must approach the problem through the channels of (1) survey, (2) elimination, and (3) isolation. With the advent of much simpler and cheaper measuring equipment it is now possible to survey the problem under consideration and obtain objective data on the actual condition which exists. It is always cheaper to eliminate the source of disturbance rather than to attempt to isolate the noise and every effort should be bent toward elimination wherever possible.

How does the human react to noise or sound in general? A survey under controlled conditions shows that the efficiency of the worker will increase 9 per cent with the elimination of the distracting sound. More important, his errors will be reduced from 30 to 50 per cent and, where the studies have been made, absenteeism among the workers has been reduced 37 per cent.

There is a degree in the objection to noise and sound. At least 20 per cent of the individuals will object to the noise from an automobile horn with only about 7 per cent objecting to the sound of a radio. The average individual will not be too much disturbed by the noise he makes, while the noise of another individual will be condemned in the loudest terms. A shock noise, one which has not been present and is introduced either with or without regularity, will be more objectionable than will a steady noise, to which the individual will adapt by accepting it as normal background noise. The shock noise must be relatively strong against the background noise. It is not a matter of absolute degree as much as of relative intensity.

Limit to Permanent Damage

The question before the industrial engineer is that of serious damage to the hearing of the individual. Below a definite level there will be no permanent harm though there may be a temporary effect and as severe exposure as 105 decibels (db) at a 1000-cycle

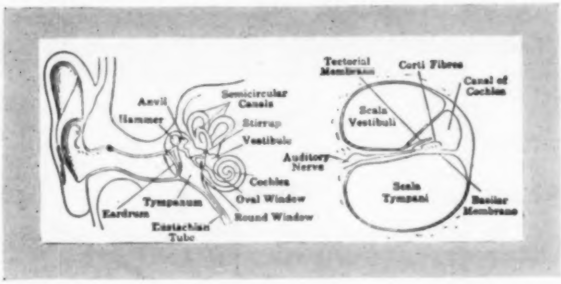


Fig. 1—General view of the structure of the human ear with cross section of the cochlea (right).

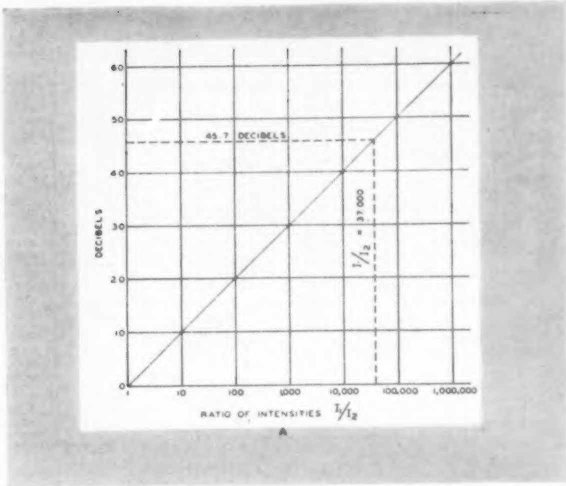


Fig. 2—Decibel intensity scale.

frequency has shown recovery after a period. However, there is definite information to show that 95 to 100 db can be dangerous and that exposure to these levels over a period of time can cause hearing impairment. High frequencies will do more damage than lower frequencies. For safety it would be well to keep the level below 90 db, and where high frequencies are present the level should never rise above 95 db.

Can Use Ear Plugs

If a study shows that it is impossible to meet a 90 db requirement, workers should use ear plugs. The worker will object to this and will offer numerous reasons why he should not wear them and every reason conceivable to show that he suffers physical distress because of the plugs. This is an old story which started back at the time guards were first applied to machines and more recently when it became mandatory that in locations where the eyes were endangered safety glasses must be worn. Just as rubber gloves and safety glasses had to be introduced by means of industrial disciplinary action, so it will be necessary to enforce the wearing of plugs where necessary and in time the practice will become acceptable. Proper education of personnel will enable industry to enforce the requirement. It is for protection of the worker as well as to protect management against damage suits.

There is no doubt that soon there will be a demand for legislation concerning noise levels of high intensity and this legislation must be built upon a solid background of scientific information. Frequently, when legislation is introduced by emotional reaction it becomes absurd in its content. It is far better if legislation is sponsored under a calm atmosphere and based upon factual knowledge. It is only recently that the danger of the high levels of noise has become a serious question which has been stimulated by suits, amounting to considerable money, being brought against industrial firms. As could be expected, any claim made would immediately become a problem for consideration by the insurance organizations.

Examination of the respiratory and cardiac effects shows that when a person is subjected to noise, breathing rate increases. Shock noises will cause breathing to stop for a period, indicating that the individual experiences an emotional reaction. That which is classified as noise will raise the blood pressure while music lowers the blood pressure. When the term music is used it means other than the loud and blaring sound which sometimes comes under this classification and is known as "hot music." Noise will make the pulse beat faster and even shock noise of the usual ringing of a telephone bell will accelerate the pulse.

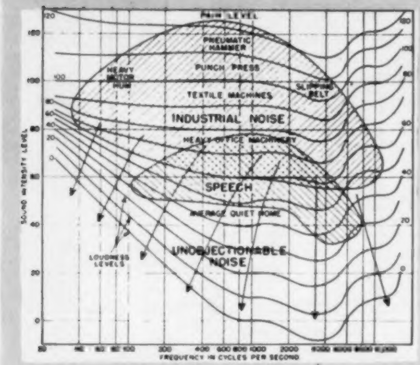
Our reaction to noise must be instinctive, for it shows all the characteristics of fear, probably one of the few instincts the modern individual retains. At levels of 85 db there are marked stomach contractions. In a study of the motor process, it is found that reaction time increases and that even knee-jerk is influenced by noise. Reactions will be affected by the character of the noise. If the individual is tested while performing mental processes rather than manual manipulations, it is found that the noise will markedly affect the quality of work as well as the quantity of work done in a measured period of time. This latter effect increases with an increase in intensity level and becomes much worse if the noise is of the shock type, applied on an intermittent cycle.

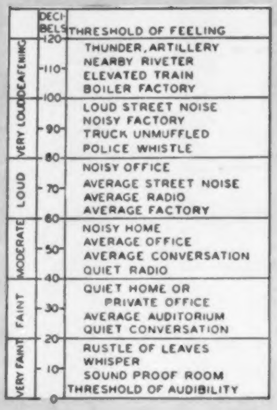
A measure of the nervous energy expended, using an absorbing room, indicates a 52 per cent expenditure but when the absorbing material is removed this value rises to 72 per cent or a 20 per cent increase and this increase is accompanied by a 7.5 per cent loss in speed.

Mental Process More Drastically Affected

Noise therefore, reduces the performance of the worker in both quantity and quality, makes concentration difficult and will accentuate nervous disorders. High levels of noise will produce unusual fatigue to the extent that it will interfere with the normal rest period and cause sleeplessness. The effect of noise on the mental process seems even more severe than on the physical components of the action.

This short analysis of the findings of noise studies should indicate to the management that reduction of noise to a minimum will prove lucrative. It is not just a question of the avoidance of damage suits but the elimination of noise will return profits because of the fewer absences and less turnover, with a more efficient worker performing his task with greater accuracy and reliability. No mention has been made of the accidents which may be traceable to noisy conditions, in particular the emotional reaction to shock noises. There is some indication that noise affects the older worker more severely than the younger worker and with our





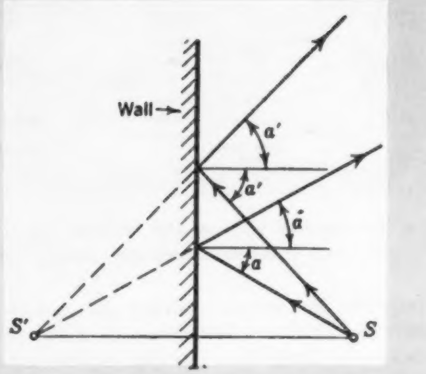


Fig. 3 (left)—Equal loudness intensity curves and relative position of normal sounds. Fig. 4 (center)—scale of loud intensities. Fig. 5 (right)—Sound reflection from wall structure composed of non-absorbing material.

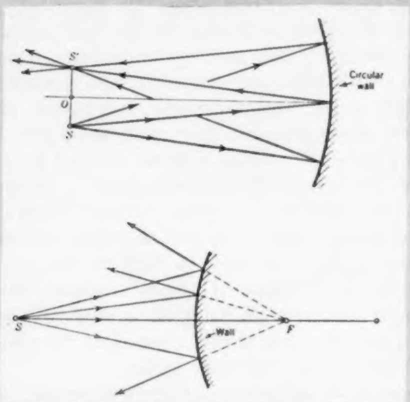


Fig. 6—Sound reflection of concave and convex surfaces.

working population increasing in the higher age groups, elimination of unnecessary noise may have a very important economic effect.

Of interest is the receiving and translating mechanism which takes vibrations, a purely physical and objective condition, and translates them through a physiological process, to a stimulus which produces definite physiological effects. The ear (Fig. 1), pictured in every elementary physiology text, acts as the generator for the electric voltage which transmits a current to the brain over a nerve conductor. The vibrations are conducted through the air into the passage of the ear and into the inner ear where they are converted to electrical voltage. This transmits energy, in electrical form, over the auditory nerve to the brain and stimulates the brain region, which stimulus is interpreted into noise, sound, or even pain depending upon its character and intensity. That this is an electrical phenomenon of communication has been demonstrated by actual laboratory experiments in which the auditory nerve of a cat has been exposed and connected to an amplifier which in turn was connected to a loud speaker. The ear of the cat could then be used as a microphone and all sounds received by the ear were reproduced in the loud speaker.

Ear A Microphone

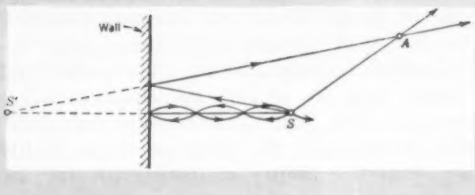
The ear, a human microphone as it were, has a marvelous range and sensitivity. In frequency, the ear may respond to from 20 to as high as 20,000 cycles which range is affected by physiological conditions, influenced both by health and age. The ear is so sensitive that the energy represented by the latent heat in a drop of water of 1/16 in. diameter represents an increment of energy which could operate a telephone receiver, at 1000 cycles, in the range of audibility for a period of 3×10^8 years. This remarkable instrument is in normal service to interpret speech represented by 10 microwatts, loud sounds at 1000 microwatts and a whisper of 0.1 microwatt. Sound is measured in terms somewhat different from those met with in normal industrial measurements. The term can hardly be graced by the name of a unit for it represents a ratio and unless the reference is fixed, the term represents merely a comparative degree. The fixing of the barely audible sound at 10^{-6} watts per sq cm permits the use of the *decibel* as a unit. All other levels of sound are referred to this base, the general expression of the measure being

$$db = 10 \log (I/I_0)$$

where I is the intensity being investigated and I_0 is the base mentioned before. The diagrammatic (Fig. 2) representation will fix the relationships more firmly in the mind than will any attempt at a description. The ear will just recognize 1 db difference in intensity which is an increase of intensity of approximately 26 per cent.

How Ear Responds

The ear response is not linear but follows the characteristic curves shown in Fig. 3, the sound intensity in db being plotted against frequency. Dr. H. C. Hardy has attempted to isolate industrial noise and normal



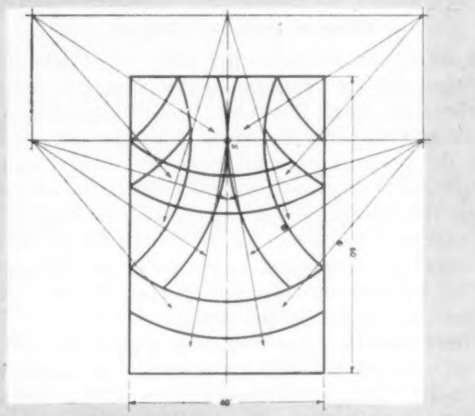
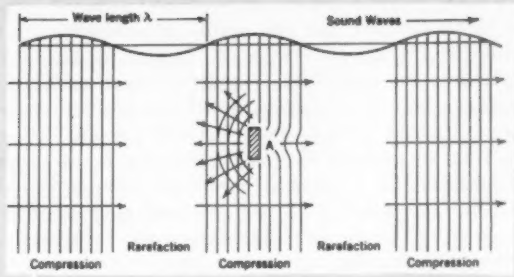


Fig. 7 (above)—Interference in sound reflection and standing waves. Fig. 8 (below)—Inter-reflections in a room 1/30 sec after impulse leaves source.



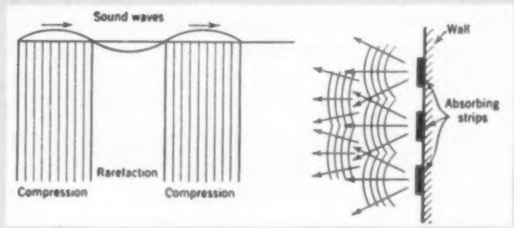


Fig. 9 (above)—Diffraction of sound waves by reflection from an obstacle. Fig. 10 (below)—Acoustical material diffuses sound, distributes reflected sound.

speech in their proper positions on this intensity-frequency diagram. The pain level, actual acute suffering, is marked above 120 db but injury to the ear may be produced below this level. With our present knowledge, a safe limit should be considered at 90 db which should be modified according to the frequencies present. The higher frequencies will cause the most damage. Any attempt at formulation of either specification or legislation must be tempered with all the present information available and much more is desired for unquestionable limits which would satisfy all authorities.

The listing (Fig. 4) more clearly represents noise levels for the casual student of the subject. Here is shown the range from a whisper at 10 db to the crash of thunder at near 120 db, and most of the commonly met noises are listed in their proper position as to intensity. With such a table one may to some fair degree locate a sound in intensity range. However, this is a very crude method of approaching the problem. It is always a fault to depend upon human judgment when measurements are involved.

Enclosed Sound Behavior

A study of the behavior of sound in an enclosure is important in a study of sound and noise control. Sound behaves like light in geometrical optics. Though both sound and light are treated by wave analysis, their characteristics are quite different. It is assumed that sound in the enclosure travels in a straight line following the fundamental corpuscular theory. An analysis of some sound traces (Fig. 5, 6, 7, and 8) in an enclosure brings attention to the problem which must be considered. In Fig. 5, the sound emanating from a source S strikes a wall of nonabsorbing material and is reflected with the angle of reflection equivalent to that of incidence. In Fig. 6, the sound ray approaches a concave surface causing it to be focused to a point, a very undesirable condition from an acoustical point of view. If the surface is convex, the sound is diffused. In another condition that may arise (Fig. 7), the source is so located that interference may be produced, causing standing waves.

Speed Independent of Intensity

Sound reflection, as discussed in the foregoing, has not considered the rapidity with which sound travels. Sound travels at 1120 ft per sec (763 mph), a value that has become important because of the speed the modern plane has attained, and this is independent of either the pitch or intensity. In Fig. 8, an enclosure is shown at the end of 1/30 sec, representing the intermingling of the sound in a short time interval. The ear has to determine the correct interpretation of speech or music under rather severe conditions when one considers the interreflections in an enclosure and the range of frequencies and intensities. Enclosures improperly designed make understanding and articulation difficult if not impossible. If there is as little as 1/15 sec, in time difference, between the direct and reflected component there is an echo; hard parallel walls cause a flutter and resonance reinforces the sound, while time phase difference may produce beats. The characteristic that makes an enclosure untenable for voice and music is called *reverberation*. Where it is necessary to understand speech or to listen to music (the latter at present is not an industrial problem), the enclosure must be corrected by the judicious use of absorbent materials.

The two schematic layouts (Fig. 9 and 10) show

how acoustical treatment influences the propagation enclosure; sound is interfered with and diffused locally but it is possible for the wave to proceed without serious modification. Where the acoustical material is applied to the hard surface that causes disturbing reflections, the sound is diffused and the previously mentioned distress phenomena are not present. Proper application, in both location and quantity, of acoustical material for acoustical control is beyond this discussion. The control of the reverberation is directly proportional to the cubic content of the enclosure and inversely proportional to the absorption (a product of the area and the coefficient of the acoustical material used). The reverberation time must be so controlled that the original sound level is reduced to 60 or 70 db before another sound is introduced to the ear.

Before acceptable limits for reverberation can be considered, it is desirable to study the action of sound

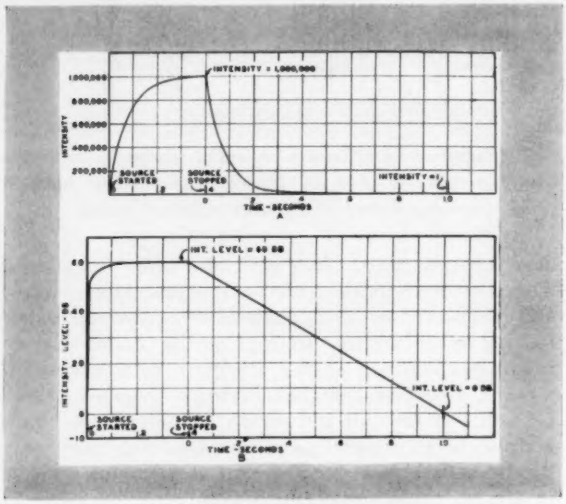


Fig. 11—Decay of sound in 1-sec reverberation room. Comparison of intensity and decibel plot showing advantage of latter in this application.

in an enclosure during its period of decay (Fig. 11). The decay of the sound in a room with a 1 sec reverberation time is shown plotted both on the linear and logarithmic scale (decibel scale) which demonstrates the advantage of using the measure of decibels in the study of sound. In a diagram (Fig. 12) with reverberation time plotted against enclosure volume, the acceptable reverberation time for good and excellent speech reproduction is shown. The average individual is acquainted with the ringing effect produced in large unoccupied rooms because of the high reverberation time. A correction is subject to definite analysis and satisfactory specifications for the correction of this type of acoustical defect may be made.

Select Word Test

It is necessary not only to reduce the reverberation time but to carry it to the point where articulation is satisfactory. Tests for this are made with a selected set of words read in a definite manner. Though formerly at the discretion of the tester, the test can now be standardized with public address equipment. A 75 to 85 per cent articulation, that percentage of the words understood correctly, is nearly perfect since the mind will substitute that which the ear fails to hear. However, size of the enclosures and intensity influence the end results. Nothing very much below what is considered perfect is acceptable for clear understanding. The curves (Fig. 13) of per cent articulation against reverberation time, with volume of the enclosure as a variable, demonstrate the influence of size of the enclosure upon the ability to distinguish the spoken word.

Effect of Enclosed Objects

Figure 14 demonstrates the effect of objects in the enclosure and the treatment of the enclosure upon the reverberation time. The subject for this demonstration is a theater with the variables being the size of audience, the presence of different types of seats and the application of an acoustical treatment to the enclosure. Where it is necessary that instructions be transmitted, it is necessary to correct the enclosure for sound control either in its original inception or by the application of known controlling materials in the correct amount and at the proper places.

Where sound may be defined as a physical vibration and an agreeable stimulated sensation of communication, noise, though produced and received in the same manner, is definitely disagreeable. Frequently one man's sound is another's noise. We are far more tolerant of our own noise than we are to that produced by someone else. The use of public address systems in an attempt to increase the per cent of articulation in an enclosure without the control of the original poor acoustical surrounds will merely result in the production of noise rather than in improved articulation. Public address systems cannot be considered seriously, unless the intensity is too low in an acoustically correct enclosure, without taking a chance of making the condition worse rather than better. Many installations of amplifying equipment have proved disappointing because of this condition.

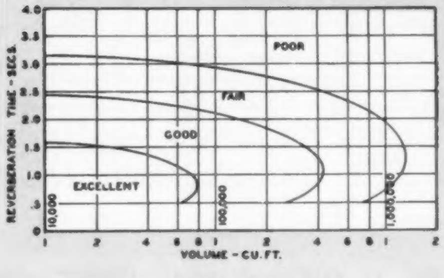
Noise Breeds Noise

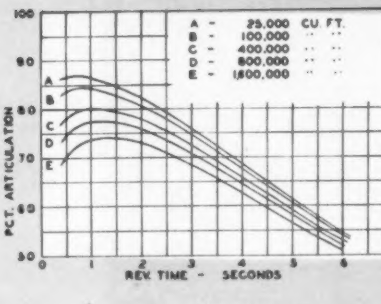
The problem of noise quieting may be accomplished with less material than the elimination of reverberation. As noise breeds noise, in any area, since an individual tends to lift his sound above that of the surrounding sound, quieting tends to reduce the prevailing noise. As a result, a few decibels of acoustical material will produce considerably more decibel noise reduction than calculated, because the individuals reduce their normal noise output. A normal reduction of 5 db is usually satisfactory and 10 db may be considered the limit of economical investment in attempting to reduce noise in an enclosure. The reduction is expressed by

$$\text{Reduction in db} = 10 \log a_2/a_1)$$

where a_1 and a_2 are the absorption before and after treatment. The calculations for reverberation time and noise reduction are relatively simple. The application of the material correctly may be more involved and require more mature judgment.

Sound at any point in an enclosure (Fig. 15) is composed of a direct and a reflected component. The direct sound is a function of the distance while the reflected sound is a constant at all points in the enclosure. Fig-





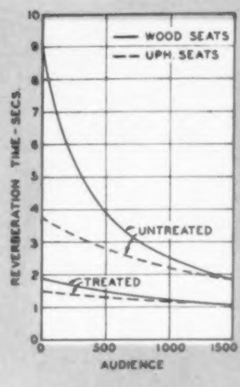


Fig. 12 (left)—Acceptable reverberation times in various size enclosures for various hearing qualities. Fig. 13 (center)—Per cent articulation in various size enclosures for reverberation time. Fig. 14 (right)—Reverberation study of an auditorium for effect of acoustical treatment of enclosure and objects. Audience, seats are variables.

ure 15 shows the effect of combining the two components showing at what distance from the source the direct component disappears into the reflected component. The individual, because of his development, associates noise with his psychological fear emotion and, regardless of the noise, if he cannot keep it located he is not relaxed or comfortable. With a reduction in the noise, by treatment, the loudness of all sounds in the enclosure is decreased and the direct component is reduced more than the reflected one. The noise is not only reduced but seems to recede, producing relief in a psychological sense.

Up to this point the stress has been placed upon the sound in the enclosure and the effect that it produces, and why it must be controlled. In industry more frequently it becomes necessary to keep sound out of the enclosure because some industrial noises are interfering with the work being done in a specific area. Little will be gained by reducing reverberation and noise if the prime source is outside. The external noise infiltration is reduced directly to the extent that the surrounding surfaces will absorb the sound. Here mass and acoustical materials are essential, with mass playing an important part. Figure 16 shows the effect of isolating walls or partitions. If the sound is to be isolated from an enclosure the enclosure must be made sound tight. Open doors and orifices into the enclosure will to a great extent nullify any attempt to isolate the sound.

Air Not Good Insulator

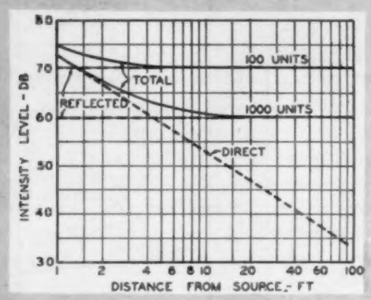
Air does not make an effective insulator and even thin walls are proportionally more effective per inch than very thick walls. With air spaces in walls of from $1\frac{1}{2}$-16 in. thickness, transmission loss is from 33-49 db. Resonance in the partition may cause a thicker wall to transmit more than a single surface. Floors may be the main offender in the failure to isolate sound for they are good conductors in themselves and continuous air channels under the floor will make conduits for bringing in the sound through isolated regions. It is well to completely sever the floor structure and block the space where air ducts may conduct the sound.

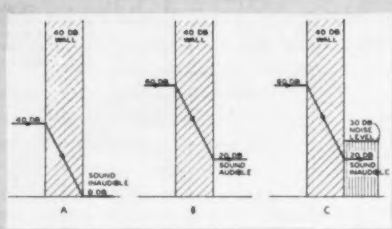
Another sound source may be produced when floors, wall and partitions become large vibrating diaphragms. These receive their energy from vibration originating nearby or at some very distant point. Very slight diaphragm motion will produce appreciable sound energy and this, in conjunction with the sensitivity of the ear, may produce disturbances more severe than the local sounds. With a diaphragm moving only 6×10^{-6} in. there is an audible sound . . . with an 8×10^{-3} in. motion the sound is uncomfortably loud . . . and with an amplitude of 4×10^{-4} in. the sound is overpowering in magnitude. The simple answer to this problem is to reduce the source of the vibrations and this will in turn reduce the sound produced from the vibrating surfaces.

Two Types of Source

The usual source is either impact from rolling equipment or the operation of a rotating machine. The correction in each instance is to introduce enough mass and elasticity so that the energy is dissipated between these two physical characteristics of the supporting body. With rotating machinery the equipment should be in static and dynamic balance and if the fault does not lie in one of these factors then control of the vibration waves is necessary. Figure 17 shows, in a schematic diagram, the insulation of a rotating piece of equipment so that the vibrations will not be transmitted. Note that the insulation must be complete, even to the anchor bolts.

Where the noise comes from some material object being fabricated or cleaned in a manufacturing process, there are two common effects that may be reduced if not completely suppressed. These two disturbing noise sources are the "bell action" of hollow objects and the resonance effect because of tables and benches. The "bell action" can be reduced by using some means of suppressing the ringing of the object just as one would quiet a bell that is making too much noise. Mass is the answer for benches and work tables to reduce the resonance and vibrations. Vibration frequently will run from 2 to 10 per second while the sound produced will cause the most disturbing effect in the region from 500 to 2000 cycles. Heavy concrete





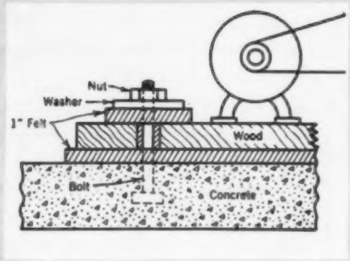


Fig. 15 (left)—Direct and reflected components of sound in enclosure. Fig. 16 (center)—Isolation of sound by partitions. Fig. 17 (right)—Schematic diagram showing various methods utilized for vibration control.

work surfaces will usually assure a suppression of the resonance.

It is essential that a survey be made to determine just what the problem may be. There are approved technical methods for the control of reverberation, noise levels, and vibrations. The problem of noise in the enclosure may be solved by control of the reverberation and absorption, while the noise from the outside may be controlled by isolation and vibration control. Because of necessity, industry finds itself facing serious consideration of the noise problem, not so much for comfort and relaxation, which in themselves will pay dividends in better production, but because of instances where the intensity of the sound has reached such high levels that permanent injury is being done to the hearing of employees. In the past this has been accepted as an occupational hazard and in specific trades deafness with age was considered normal. Since this is not necessary, it is to be expected that the future will bring demands for noise control, at least to the limits of reducing injury to the worker in the severe noise areas.

Acknowledgment

Illustrations used in this paper came from several sources among which are *Acoustics of Sound* by Watson and *Less Noise, Better Hearing* by Hale J. Sabine.

Bibliography

Though the publications listed do not necessarily give an answer to any one specific problem, they do outline the principles of noise and vibration control. Application of these principles will depend upon the judgment of the individual. Future study of specific remedies will find their way into publications and prescribed specific methods will be enumerated.

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Tapping steel heat (right) for sand molds which will move into pouring position on roll conveyor in foreground. Emergency aircraft landing strip panels are used to cover the floor over the furnace pit.

Development of a West Coast Steel Jobbing Foundry

HERBERT F. SCOBIE/*Editor*

About two years ago two young foundrymen took up where an old timer left off in the development of a steel jobbing foundry. Here's what the shop is like today.

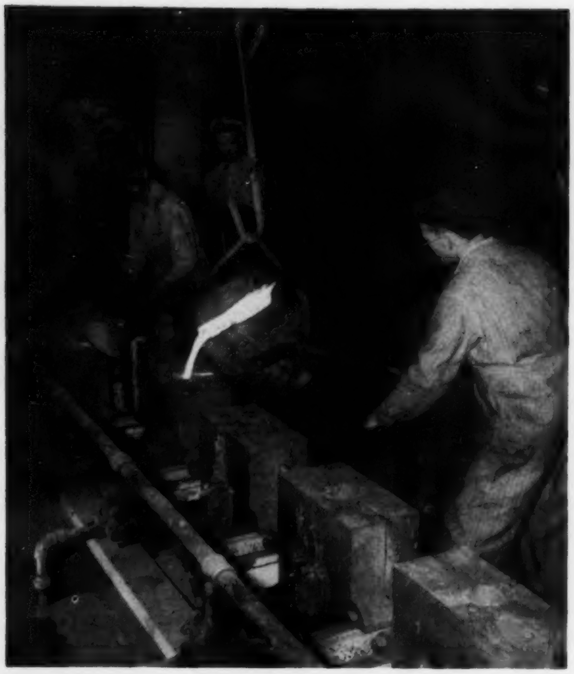
■ On April 1, 1952, Spokane Steel Foundry Co., Spokane, Wash., headed by John C. Tenold, president, and Jack Fagerstedt, vice-president, purchased from Robert W. Bruce, facilities he was developing for steel castings production. These included a 150 x 40-ft. new cement block building for the foundry proper, an attached compressor room, a washroom, a 3000-lb acid electric furnace, transformer, compressor, sand mill, and an overhead crane, plus real estate with room for expansion. Also included was an incomplete production unit for casting grinding balls in permanent molds.

The new owners added an office, a chemical laboratory, and a pattern storage room. They installed two jolt-squeeze machines and three jolt-rollovers, built flasks and bottom boards, added roll conveyors, and completed the grinding ball unit. The latter called for a skip to catch hot castings during shake-out and elevate them to a quenching tank, a quench-tank unloader, and some permanent molds. Recently a shell molding machine was installed.

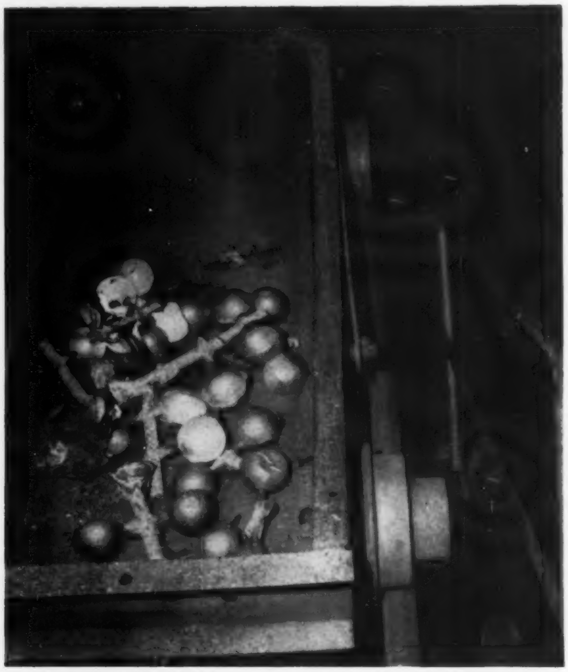
Carbon Steel Castings Produced

Spokane Steel Foundry produces all types of steel castings, but particularly those for mining, logging, and agricultural use, ranging in weight from less than a pound to 2500 pounds. While the entire range of carbon steels is produced, the bulk of these contain 0.25 per cent carbon. Also produced are some stainless steels, and the grinding balls which contain 0.9 per cent carbon and 1.0 per cent chromium. On a three-shift basis, ten tons of steel can be turned out daily. Normal operation calls for production of six tons a day.

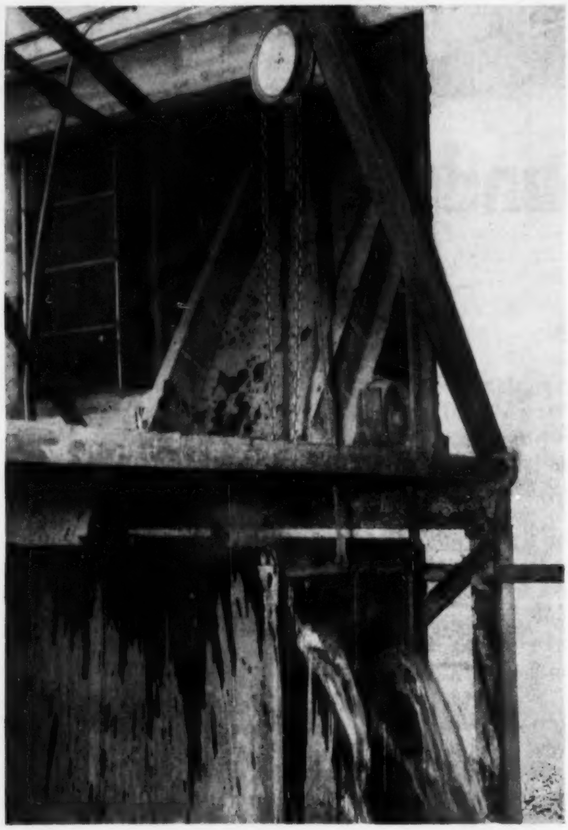
All heats are analyzed in the laboratory, the customary determinations being made along with alloying elements such as nickel, chromium, copper, and



After pouring and solidification, grinding balls drop into car positioned directly below the molds.



Partly-filled car on way up incline will discharge hot castings into water quench at end of the lift.



Sheets of water pour over end of the quenching tank, into which grinding balls have been dumped by car conveyors (see illustration at right above).

molybdenum. Preliminary carbons are run volumetrically, final carbons gravimetrically.

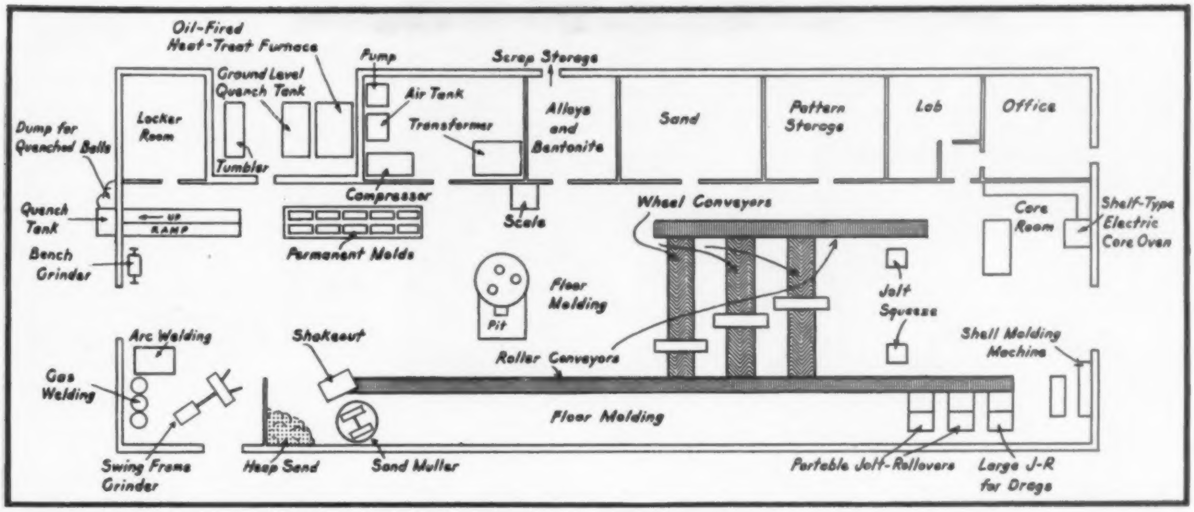
Larger molds are made on the floor, medium-sized production work on the jolt-rollovers, and small production work on the jolt-squeeze machines. The largest of the jolt-rollovers is used for drags, the two smaller machines for copes or drags. Molds are made in both tapered light-metal flasks and in tight steel flasks. Molds for production jobs are moved to pouring position by way of roll conveyors. Squeezer work is placed on 12-ft 2x10's which serve as pallets, enabling groups of molds to be moved lengthwise along a roller conveyor and transferred laterally on wheel conveyors to the pouring area.

To save molding time and floor space, flatback jobs are often stacked. Using conventional cope and drag equipment, four or five drags are made, each with a sprue cut all the way through. These are stacked with the sprues aligned and topped off with a cope.

The wooden bottom boards originally made in the foundry are gradually being replaced with aluminum.

Molds small enough to be shaken out by hand are dumped on a portable shake-out at the end of the pouring conveyor. The shake-out throws the sand into a bin adjacent to the sand mill. Prepared sand is distributed by crane in sheet-metal dump boxes. Green sand is used for the bulk of the castings and molds are skin dried for the larger jobs.

Base sand is an Ottawa sand with an AFS grain fineness number of 60. The standard green sand mix contains 300 lb heap sand, 100 lb new sand, 12 lb western bentonite, $3\frac{1}{2}$ lb cereal binder, and not over 3 per cent moisture. Moisture is kept as low as possible to minimize pinhole formation. For skin-dried work, the mixture is 400 lb sand, 100 lb 140-mesh silica flour,



Floor layout of Spokane Steel Foundry. Production area is 150 x 40 ft.

6½ lb western bentonite, 3½ qt core oil, and water till sand feels of proper consistency. In skin-dried molds, all new sand is used for castings weighing 500 lb or more. For smaller castings, the skin dry mix is one-half to one-third new sand. Molds are skin dried with a butane gas torch after application of a proprietary mold wash.

Air-Dry Mix for Chunky Cores

Most cores are made with an oil-sand mixture except for certain chunky cores in which an air-dry mixture is used. The oil-sand mixture consists of 300 lb sand, 20 lb silica flour, 2½ lb western bentonite, 7 lb iron oxide, 4 lb cereal binder, 3½ qt core oil, and 11 qt water. The air-dry formula calls for 100 lb sand, 3 lb western bentonite, 1½ lb dextrin, 5 oz cereal binder, and 4 per cent water. Cores made from this mixture air dry in about four hours; while generally satisfactory, they cannot be pasted.

All cores are made by hand except stock cores which are made with the usual extrusion type of equipment. Cores are baked in an electric, shelf-type oven.

Cleaning room equipment consists of a swing frame grinder, a double-end stand grinder, a hand grinder, and acetylene and electric cutting and welding equipment. All castings are shot blasted and some also are tumbled. For heat treating there is an oil-fired oven and a ground-level quenching tank in a pit.

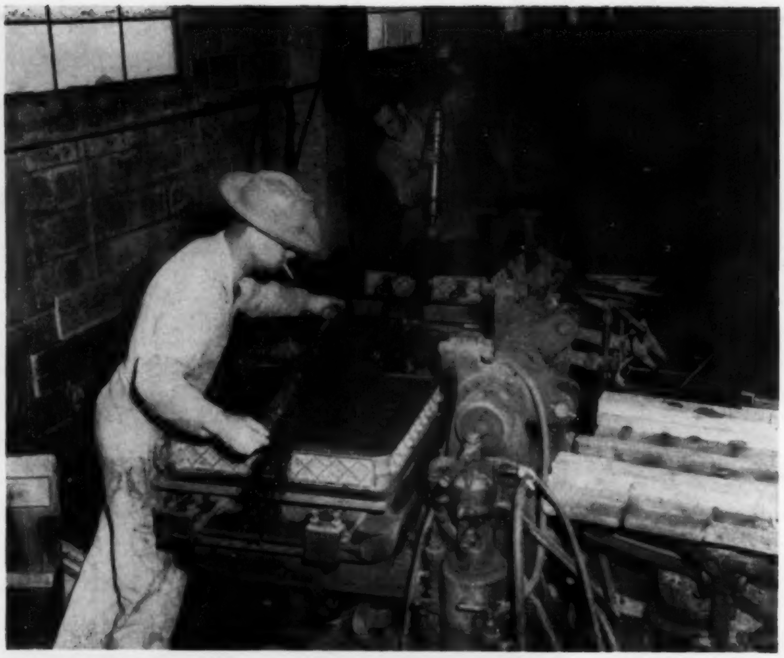
Grinding ball production, except for 2-in. diameter and under which are made in green sand, is carried on in permanent molds. A double row of ten molds each is positioned on either side of a row of air cylinders. When a mold on one side is closed (parting line is vertical), the mold with which it is paired is open and vice versa. After the molds on one side are poured, they are opened so the gate of balls can be pried out.

The hot castings drop into a skip which is moved along a pit below the molds, powered by a cable and motor. As the skip clears the end of the rows of molds, it goes up an incline and dumps through an opening in the wall into an outdoor quenching tank. Residual heat in the balls keeps them above the critical temperature until they tumble into the water. The hardened balls are discharged from the quench by raising with a chain hoist a cage hinged at one edge of the tank.

Hardened balls accumulate after dumping from tank.

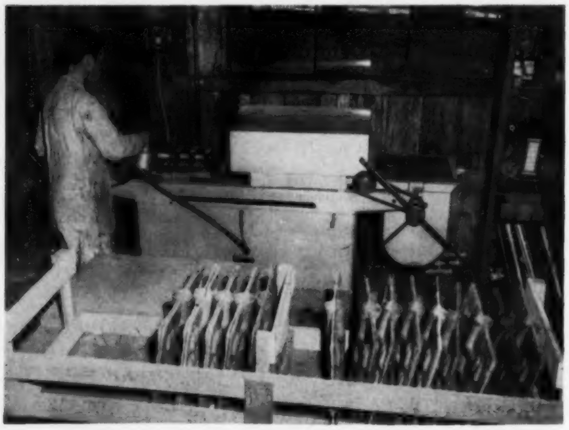
The permanent molds are cast in the foundry in green sand with oil-sand cores for mold cavities. Material is gray iron which is made in the electric furnace as needed. The molds are air cooled and do not overheat because each is used only three times in any heat. The sprues are sprayed with a silica flour wash after each cast. Care is used in applying the spray since an overly-thick coating can build up on the mold faces and cause finning.

The wash is mixed in the shop according to the following recipe: silica flour (100 mesh), 13 lb; western

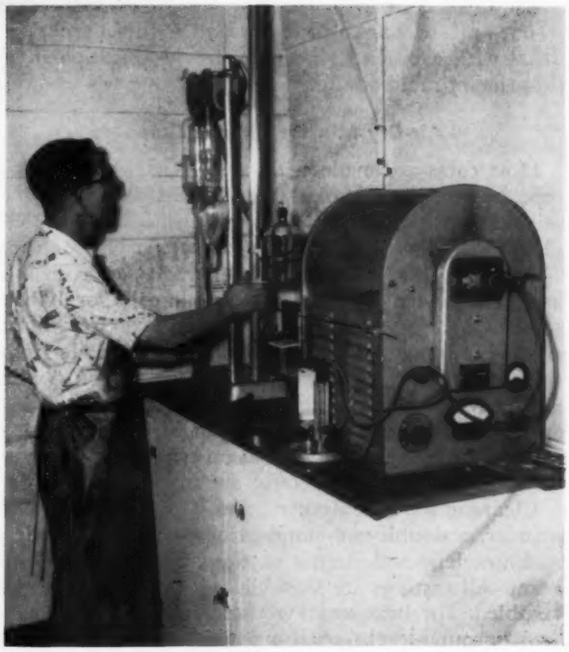


Cope and drag production on jolt-roll-over molding machines. Flasks used are quick-release type of equipment.

Pouring molds on roll conveyor in front of furnace (above). Molds cast on planks are easily moved in groups.



Shell molding machine is double ended, shell on right-hand pattern is being cured while left-hand pattern gets a silicone spray shower during production run.



Volumetric determination of carbon content provides speedier analysis of preliminary samples.

bentonite, ½ lb; dextrin, ½ lb; and sodium benzoate (preservative), ¼ lb. Warm water is added to the dry ingredients during mixing until the suspension has a consistency determined by experience to be best. This calls for approximately 8 qt of water and gives a suspension about like a thin paste. The mix is used for breaking in molds as well as during their use. The critical period in the life of a mold is at the start and new molds are heated by torch until just hot enough to make the spray dry immediately on application. Mold life is 2000-2500 casts.

The shell molding department consists of a man-

Small castings, in this case grinding balls, are molded on squeezer machines at Spokane Steel Foundry.

Portable air-driven grinders of type shown above are used for finishing small steel castings.

ually-operated, electrically-heated, shell mold machine, a home-made sand mixer, and a bench for assembling and storing molds. The machine has a dump box and pattern platen at each end and an oven that can be moved between the two ends. During the cure at one end, the operator removes the shell at the other end, rotates the pattern back onto the dump box, and inverts the dump box to form another shell. Normal cycle allows 15 seconds for dwell time, 45 seconds for cure. Preferred pattern temperature, 500 F, is checked by means of a temperature-indicating crayon.

Shell halves are stored on an adjacent bench until ready for assembly. Shells are cemented with a syrupy fluid (resin binder and methyl alcohol) applied with a wooden paddle. Assembled shells are held together temporarily by large wire "bobby pins" while the assemblies are heated briefly under the shell machine oven. For pouring, the "bobby pins" are removed, the shell molds are placed in a metal box, and backed up with pea gravel.

Spokane Steel Foundry does not make shell mold patterns but does advise on their construction and gating, and specifies the number and location of ejecting pins. To start a pattern, silicone parting compound in paste form is applied to the cold pattern. Temperature is then brought up to 500 F and held 15-20 minutes.

The sand-resin mixture used for shell molds is made up in 100-lb batches of 180-200 mesh silica sand and 4 lb phenol-formaldehyde resin. Mixing equipment consists of a metal drum about 12 in. in diameter and 24 in. long equipped with vanes which keep the mixture from merely sliding along the wall of the drum as it is rotated. The drum is rotated at 100 rpm for a minimum of 15 minutes, direction of rotation being reversed several times during the cycle.

Foundry constructed its own swing-frame grinder in shop, uses it to clean up riser contact on dredge bucket.

A. Dunlop / *Director, Shaw Processes Ltd., Newcastle-on-Tyne, England*

Fig. 1—Human hand was used as pattern for this 18-8 stainless steel casting.

Investment Precision Casting Without Expendable Patterns

A. Dunlop

Refractory molds are poured over patterns as a slurry which gels to rubbery consistency ready for ignition. Flexibility of mold in gel stage makes possible use of one-piece patterns with back draft. Surface detail and precision are high. The paper use presented before the Scottish Branch of the Institute of British Foundrymen and is published in *American Foundryman* through the courtesy of the Institute of British Foundrymen.

■ The terms "precision casting" or "investment casting" are normally associated with the lost wax process. The history of the development of the lost wax process as applied first to dental work and later to jewelry has already been summarized[1] and also its application to industrial castings.[2]

The lost wax process differs in three major respects from normal sand casting.

1. The pattern of the desired part is made of an expendable material, generally wax, and a new pattern is required for each casting.

2. The molding mixture has the consistency of thick cream and it is then consolidated by vibrating.

3. A hot mold may be used, thus facilitating the successful running of the edge and the reproduction of the finest detail.

Investment Process Without Expendable Pattern. The investment process to be described in this paper differs fundamentally from the normal lost wax investment process in that no wax or expendable patterns are employed and accurate molds are produced directly from suitable master patterns. Thus complications associated with wax-molding dies and wax-injection equipment are avoided and dimensional errors arising from wax shrinkage and distortion are eliminated.

Figure 2 shows a flow sheet of the operations involved. The first step is to make a master pattern preferably in brass, bronze, steel or plaster of the part required. Wood has on occasion been successfully used for the pattern but it should be borne in mind that the final casting produced can be of no better accuracy or surface finish than the pattern used. The pattern incorporates the necessary allowances for metal shrinkage only, the final mold cavity being exactly the same size as the pattern. To ensure

maximum accuracy the pattern is not split as in normal sand practice. The pattern is invested one section at a time with a non-refractory liquid setting material of the plaster of paris type. For simple shapes, two pieces only are required to invest the pattern as illustrated in Fig. 3.

An alternative method is to produce negatives of the mold pieces in plaster type material. From these negatives, positive parts in refractory mold material are readily made. This technique is illustrated in Fig. 4.

Preparation and Characteristics of Mold Material. The high accuracy and smooth surface finish obtained in castings made by the process are largely due to the unusual properties of the mold material. The mold material is prepared in the form of a slurry by mixing a suitably graded refractory filler with a colloidal suspension of silica in alcohol to which a reagent has been added to produce a carefully controlled gelling reaction. The liquid portion of the slurry is produced by controlled hydrolysis of ethyl silicate. The reaction converting this slurry to a tough rubbery gel can be represented by the equation:

$$\underset{\text{Ethyl Silicate}}{Si\ (OC_2H_5)_4} + \underset{\text{Water}}{4\ H_2O} = \underset{\text{Silica Acid Gel}}{Si\ (OH)_4} + \underset{\text{Alcohol}}{4\ C_2H_5OH}$$

For ease of manipulation, a partially hydrolized solution of ethyl silicate is prepared which has a shelf life of approximately one month. Prior to the admixture with the refractory, a gelling reagent is added to the ethyl silicate solution, the amount added depending on the speed at which the gelling reaction is required. Figure 5 shows the relation between gelling time and amount of gelling reagent. For small molds, a gel time of about one minute is convenient while for large molds requiring longer mixing time a gel time of about five minutes would be more suitable. It will be seen that the gel time is at the complete control of the operator.

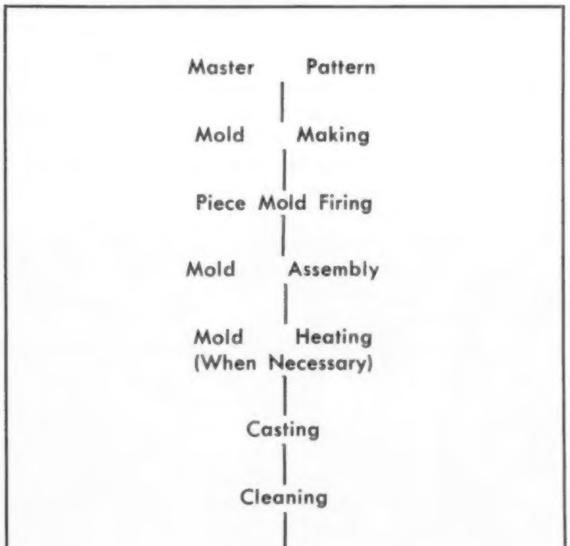


Fig. 2—Flow sheet of Shaw process.

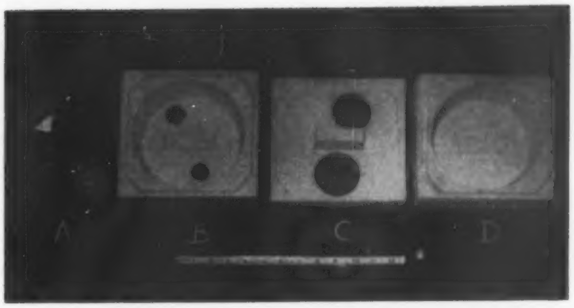


Fig. 3—Refractory mold halves C and D were made from extrusion die A and plaster match B.

Fig. 4—Steps in producing refractory mold pieces from plaster negatives. Golf club pattern A was used for plaster mold pieces B and C, which in turn formed positives D and E. Refractory mold pieces I and J formed from D and E, combined with core from G, produced casting K.

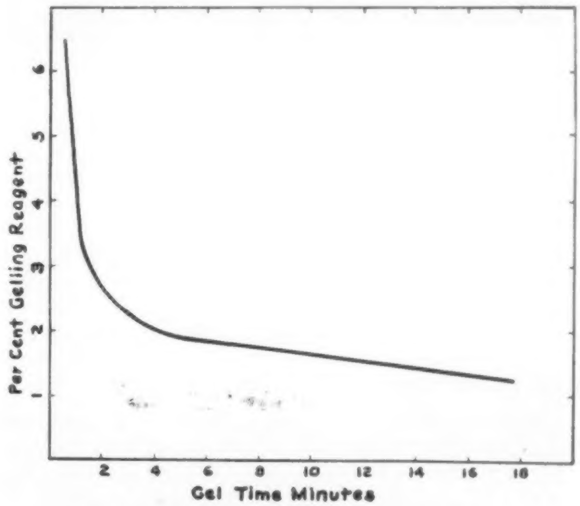


Fig. 5—Effect of gelling reagent on gel time.

As the gelling process progresses, the mold slurry solidifies, passing through the tough, rubber-like phase already mentioned. The mold is stripped from the pattern while in the rubbery condition making possible the use of patterns with no draw and in some cases even with a slight undercut.

Reference to the above equation of the gelling process shows that a product of the reaction is alcohol. Mold pieces in the rubber-like condition are rapidly fired by igniting the alcohol.

A solid mass of gel allowed to "dry" slowly such as

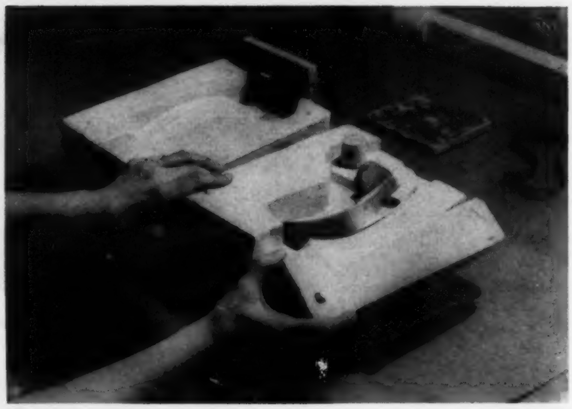


Fig. 6—Preparing plaster boxes and patterns to receive mold material for stack-mold sections.

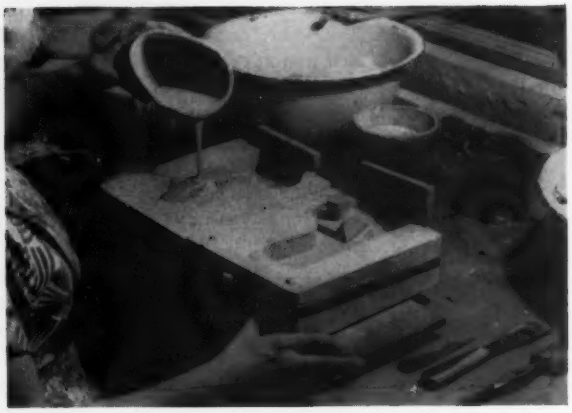


Fig. 7—Pouring refractory slurry from rubber bowl. Mold members held together by rubber bands.

being left at room temperature, would shrink and distort. However, the rapid removal of alcohol by rapid firing gives rise to a mold surface which is covered in a fine system of craze-cracking. This crazing is progressive, the surface system of cracks providing an outlet for the alcohol beneath the surface. This liberation sets up further deeper cracking, thereby releasing more alcohol, until the entire mass is "dry." The volume change in the gel arising from the removal of the alcohol is accommodated by the system of cracks producing a mold cavity of exactly the same dimension as the pattern. The surface cracks are so fine, however, that no metal penetration occurs on pouring the mold, the smoothness of the casting surface being unimpaired. A further advantage of the crazed mold structure is that it is very permeable and a mold so produced requires no artifical venting.

The mold is also completely immune to thermal shock, since each discrete refractory partical is surrounded by fine cracks which accommodate thermal expansion. When the design of the casting requires a hot mold so that, say, fine detail may be reproduced, the cold mold can be placed directly into a hot furnace and rapidly heated without any risk of mold damage by cracking or spalling of the surface. This heating of the mold has no significant effect on the dimensions of the mold cavity—all that happens during heating is that the fine cracks close up a little.

Mold Assembly. After firing, the mold sections may be thoroughly inspected before assembly. The assembled mold suitably clamped is now cemented together by pouring around it a thick, quick-setting refractory slurry. Again, the cementing material is fired by igniting the inflammable constituent of the binder liquid.

The now essentially one-piece mold can be cast at room temperature or if the alloy or shape of part warrants it, the mold may be heated to temperatures up to 1050 C. The ability of the mold to be so heat treated quickly, speeds up the process considerably.

Stack Molding. For high productivity of smaller castings, a system of automatically located stack molds is used for group casting, so that the mold assembly for presentation at the furnace is a multiple, giving any desired number of castings from a common sprue. This procedure speeds up mold manufacture and also reduces the amount of mold material required. A typical pattern set-up for producing mold pieces for stacking is shown in Fig. 6. The right hand pattern set-up to make one of the mold faces is in brass while the other is plaster. As will be seen, the patterns are placed in plaster boxes which will contain the refractory slurry. Each mold half comprises a base slab upon which two loose blocks form the walls of the slurry container or what would be called in normal foundry practice the flask. Suitable registration projections on the underside of the side blocks are located in corresponding recesses in the slab. Register-steps formed on the base slab ensure that the finished mold halves wil be correctly aligned on final assembly to form the stack.

Rubber Band Holders

In Fig. 7 a measured quantity of mold slurry is mixed in a rubber bowl and poured over each pattern. During the pouring of the slurry, the mold members are held together by rubber bands, which are readily removed when the slurry has set, to release the refractory cast. When the primary facing has set, and this setting time is under control, the mold members are clamped face to face as shown in Fig. 8 and the mold piece completed by pouring refractory slurry which cements together the two mold faces already made.

In Fig. 9 the plaster molding box is being removed, releasing the mold piece which has a half mold impression on opposite faces with a connecting channel for running the casting.

The ignition of the inflammable component of the mold is being done in Fig. 10 while in Fig. 11 the fired mold pieces are being assembled, correct alignment being automatically obtained by the register steps on the mold faces. Included in this photograph is a completed mold luted together and ready to receive the molten alloy. A stack of castings produced from the mold is shown in Fig. 12.

Casting. In many instances the molds may be poured as in normal sand casting practice. However, when small steel castings are being made it can be advantageous to use the technique developed for the lost wax process, in which the mold is clamped on the top

Fig. 8—Mold sections held inside plaster boxes are cemented together with more refractory slurry.

Fig. 9—Removal of plaster box leaves mold section with half-mold impression on top, other half underneath.

of a small indirect arc furnace, which contains an accurately weighed molten charge of the alloy to be cast, the furnace assembly being inverted to transfer the molten alloy from the furnace to the mold.

Finishing. When the mold is cold, the refractory is broken away and the cast assembly shot blasted. Where intricate cored passages are in the casting, and the alloy allows it, the refractory can be readily removed by treatment for a short while in a bath of molten caustic soda.

The gates are cut off by conventional methods depending on the alloy, and the gate area finished by hand grinding. Castings are visually examined and when necessary a light emery dressing may be applied. When required, castings may be given an x-ray.

Dimensional Accuracy. Parts up to 3 in. in length can be cast to tolerances of plus or minus 0.005 in. per in. with a minimum tolerance of plus or minus 0.003 in. On dimensions over 3 in. in length, an overall tolerance of plus or minus 0.015 in. may be held.

Design Factors. It must always be remembered that despite the method of mold making, castings are being made and principles governing the manufacture of castings must be observed. For example, fillets are definitely helpful in the investment casting process and with many parts are essential. Abrupt changes of section should be avoided as in conventional casting. Thick sections adjoining thin sections are difficult to feed and are more subject to unsoundness.

Fig. 10—Ignition of alcohol produced during gelling.

While the flexible nature of the mold when the pattern is withdrawn allows undercuts to a certain degree, undercuts generally are undesirable. For ease of production and lower costs it is desirable to have a simple two-piece mold which does not involve complicated cores or loose pieces.

Fig. 11—Stacking fired mold sections. Completed stack is shown in background.

Fig. 12—Stack of castings produced from mold, still attached to gate.

Fig. 13—Two castings in lower right are bronze (6 oz and 3 lb). Others are aluminum alloy, weight ½-3 lb.

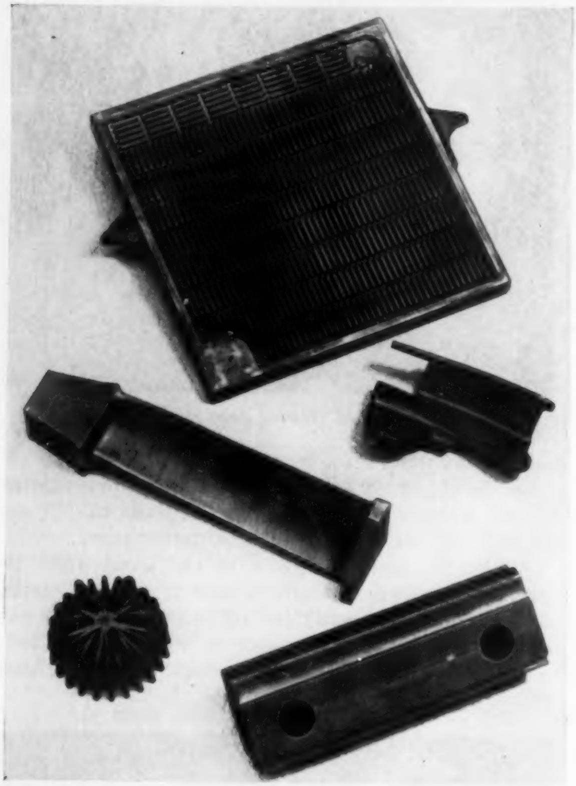


Fig. 14—Steel castings weighing 6 oz-5½ lb. At top, 18-8 filter press part. Middle left, turbine blade; middle right, carbon steel forming tool. Bottom left, heat resistant diesel engine head; bottom right, 10%-W steel breech.

Alloy Range. Castings can be made by the process in any metal or alloy that is castable by ordinary foundry processes. Pure metals such as copper, nickel, or iron are difficult to cast by any process. Aluminum casting alloys, brasses and bronzes are satisfactorily cast. Cast iron presents no difficulty. Austenitic stainless and heat resisting steels are readily handled. Tool steels cast without trouble and respond normally to heat treatment. Carbon steels and high strength alloy constructional steels are being readily handled.

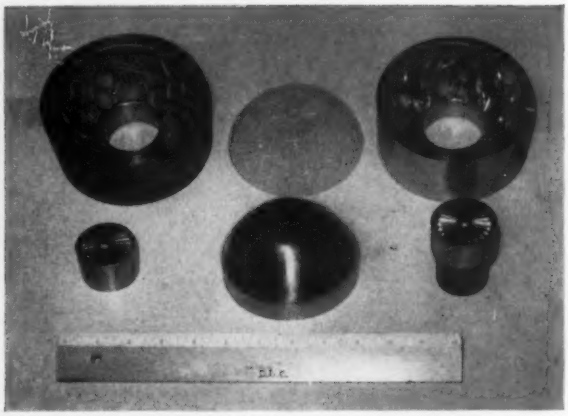


Fig. 15—Molds of 14% Cr-steel for glass dish shown in center, typical example of the process.

Hard cobalt-base alloys of the stellite type are very readily cast, and the investment process provides an ideal method of making parts in such alloys which are relatively unmachinable. Nickel-base alloys are also being satisfactorily cast.

Weight Range. Technically there appears to be no upper limit to the size of castings made by the process. To date castings in steel weighing up to 300 lb have been cast successfully.

Athough the process described offers certain advantages compared with the lost wax technique it should be regarded as complimentary rather than competitive. For instance, where large quantities of small intricate parts are required, the lost wax technique probably would be more suitable. For larger components up to about 2 lb in weight the field may overlap, but in the larger sizes, the process described without an expendable pattern comes into its own.

Economics of the Process. It will be obvious from the description of the process and the illustrations that the cost of equipment for mold making is negligible. As compared with the lost wax process, no expensive wax molds or injection machines are required, neither are vibrating tables or costly de-waxing ovens necessary. Another attractive feature of the process is that once the patterns are available all the mold making steps are done by semi-skilled workers after a very short training period. Many companies using the process employ women for mold making.

Ethyl Silicate Cost Factor

At present the biggest single factor affecting costs is the price of ethyl silicate, as a matter of fact, 80 per cent of the total mold costs including labor is due to the ethyl silicate. In many instances, labor costs are lower than in conventional sand molding.

One company using the process for small alloy steel castings reports mold costs per pound of castings to be of the order of four times the cost of using oil sand for similar work. However, in many cases the extra cost is more than saved in cleaning and finishing; often costly machining operations are eliminated.

Typical Examples of castings produced by the process described are shown in Fig. 13-19.

In addition to the examples illustrated, extrusion

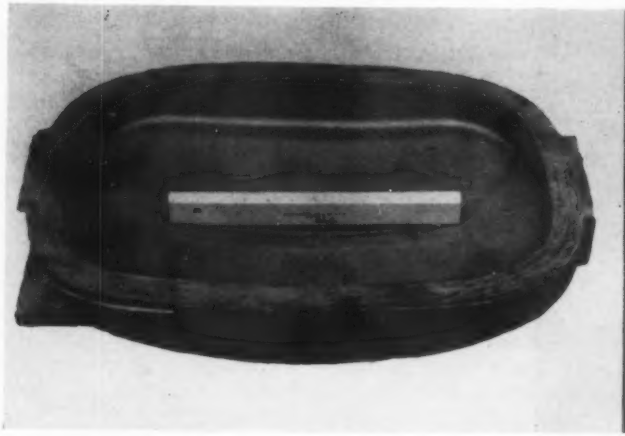


Fig. 16—300-lb, 14% Cr-steel mold for face of 21-in. television tube.

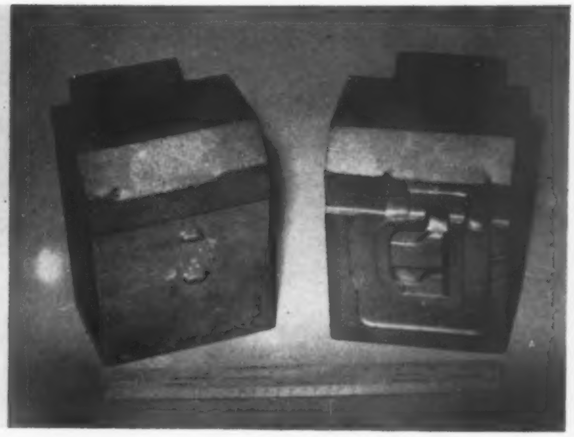


Fig. 17—Cast drop-forging dies, about 70 lb each. Steel contains 0.3% C, 1.0 W, 5.0 Cr, and 2.0 Mo.

die inserts in a cobalt-base alloy have been produced. The performance of these dies in extruding copper has been excellent as compared with conventional, machined steel dies. Alloy steel dies have a life of about 250 extrusions while the cast cobalt-base inserts at present in service have processed over 2000 billets and are still in satisfactory condition.

Assisting Conventional Techniques

A cast iron pattern is shown in Fig. 19. This casting is hollow, the average metal thickness being ½ in. It weighs just over 200 lb. This is an interesting application of the new process assisting the making of castings by the more conventional sand technique. This casting is being used as a pattern for producing sluice valve molds made by slinger.

A similar case of assisting another mold-making method is in the production of pattern plates for the shell molding process. Reduction of the cost of such patterns would considerably extend the range of application of the shell molding process. Considerable success has been achieved in this direction with the investment process described.

There is no doubt the next decade will see a revolution in mold making methods for casting production. Engineers will demand and get cast components of improved quality and enhanced dimensional accuracy. The process described indicates one way this revolution is proceeding with techniques presently available.

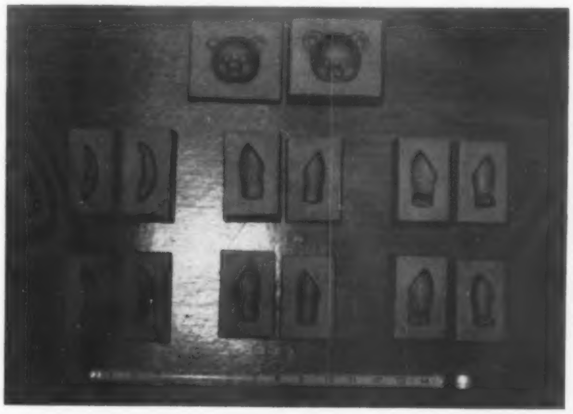


Fig. 18—Set of plastic injection dies cast in 14% Cr, 2.0 C steel.

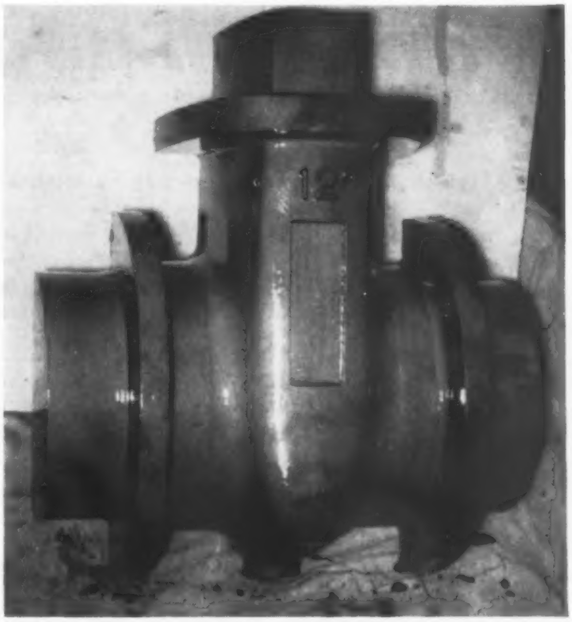


Fig. 19—Cast iron pattern made by investment process averages ½ in. thick, weighs 200 lb, used under slinger.

Acknowledgments

The author wishes to acknowledge his indebtedness to the following companies for permission to illustrate the technique by photographs of castings taken from their production: Shaw Processes Ltd., Newcastle-on-Tyne; C. Henshaw & Co., Edinburg; Precision Products (Cumberland) Ltd., Alston; Darwins Ltd., Sheffield; and Sulzer Bros., Switzerland.

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Fig. 1—Pouring brass from Wyatt submerged resistor furnace.

Induction Melting With High and Low Frequency

Low and high frequency induction melting furnaces are covered in such a way that the prospective user will know what type of induction furnace he should consider for his melting needs. The paper was presented before the January 18-22, 1954, meeting of the Industrial Electrification Council, which was held at Cincinnati.

■ All of the successful induction furnace types were developed on the principle that when liquid conductors carry heavy electric currents the inherent electromagnetic fields cause mechanical stirring forces which, if properly utilized, give the resulting furnace its most useful characteristic. The Kjellin or horizontal ring type furnace, failed because the stirring forces, uncontrolled, made operation difficult and, in the long run, impractical. The Ajax submerged resistor and high frequency induction furnaces did not fail and have had phenomenal success because the same electric current which melts the metal forces it out of the energy field while new colder metal takes its place in continuous circulation.

Figures 2 (1) through 2 (5) illustrate various types of induction furnaces. Figure 2 (1) shows the old Kjellin or ring type furnace. An energized iron core threads a horizontal annular melting channel. Repulsion between the energizing winding and the molten charge pushes the metal outward in the melting channel. Pinch effect caused by the induced electric currents in the molten metal causes constriction of the liquid conductor. With constriction comes even greater pinch effect, which causes even greater constriction, until by further compounding the liquid conductor is pinched off and current ceases to flow.

In the Wyatt submerged resistor furnace (Fig. 2[2]) the same elements are involved but the melting channel no longer is horizontal and open to the air. It is positioned vertically, or at an angle from the vertical. The head of metal above the melting channel

puts a pressure on the metal overcoming the tendency to pinch off. By its shape, and the characteristics of the induction effect, the heated metal in the melting channel is pushed out and up while colder metal moves in to keep the cycle going. As much as 400 kw and over has been expended in one such melting channel without pinching off or overheating to the point of failure.

The Tama-Wyatt submerged resistor furnace (Fig. 2[3]) follows somewhat the same principle. In this particular illustration a double melting channel is involved but the electric principle is the same.

Figure 2 (4) shows the Hultgren immersed electrode salt bath furnace. This is rarely used for melting applications, and is basically a resistance type furnace. The combination of current through and between the electrodes combines with the electromagnetic field about the electrodes to push the heated medium down and out from between the electrodes. If this were not the case the electrodes would quickly burn off and the furnace would fail.

The Northrup high frequency furnace is shown in Fig. 2 (5). No iron core is required here since the high frequency, in effect, makes it unnecessary. Each coil turn causes repulsion of the liquid metal opposite it which builds up a unidirectional stirring force in the metal—up at the center, and down at the sides. On top of this is a strong pinch effect caused by the currents in the liquid metal itself. The combined forces are additive in the upper half of the melt, but are in opposition, the pinch effect being greater, in the lower half of the melt.

By using an electrically conducting crucible the induced energy may be expended in the crucible rather than in the charge causing the charge to become heated by conduction as in a fuel fired furnace. Or only what induction is desired can be allowed to pass through the crucible and into the melt for circulation purposes. Obviously if the charge in this case is a nonconductor of electricity all the energy will be expended in the crucible and there will be no electromechanical circulation of the charge proper. This is only one variation. There are many other ways in which circulation of the melt can be enhanced, reduced or controlled.

Advantages of Induction Melting. From the foregoing figures, one learns that an electric induction furnace inherently and automatically stirs the liquid charge—the perfect alloying furnace. Metals such as aluminum and iron, opposites in weight, can be made into perfectly homogeneous alloys; magnesium which is a very light metal can be quickly distributed to all parts of a charge of iron, a much heavier metal, as a quick deoxidizer.

But circulation is not all. Extremely high power may be concentrated in electric induction furnaces insuring very rapid melting. This insures high production rates. It also insures lower metal losses because highly oxidizable ingredients are never subjected to extreme temperatures and are not even subjected to high temperature over any longer period than is absolutely necessary. Lower losses of all ingredients not only means extensive savings in dollars but the resultant alloys are much more homogeneous than those melted in other types of furnaces and analyses can be

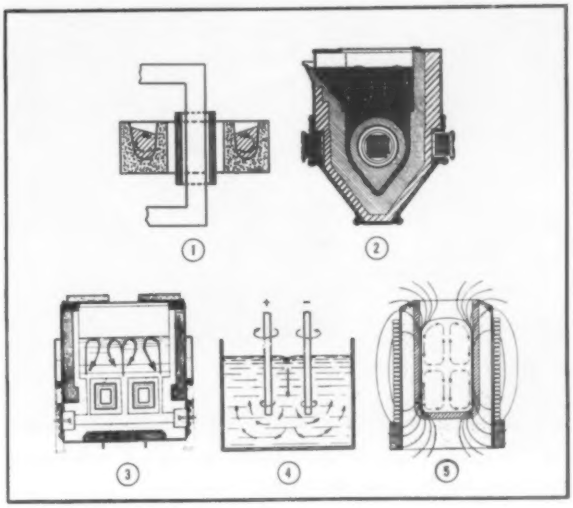

Fig. 2—Electromagnetic circulation is inherent in the induction furnace. Types shown are: (1) Kjellin or ring; (2) Wyatt; (3) Tama-Wyatt; (4) Hultgren; (5) Northrup.

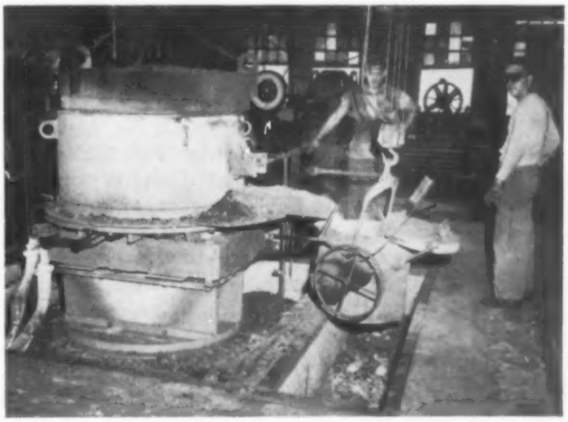

Fig. 3—5000-lb Wyatt submerged resistor furnace used for melting malleable and gray iron.

Fig. 4—Battery of Tama-Wyatt furnaces in aluminum die-casting shop. A variation of the Wyatt type, these furnaces were designed for aluminum and its alloys but have been widely adopted for the melting of copper and brass.

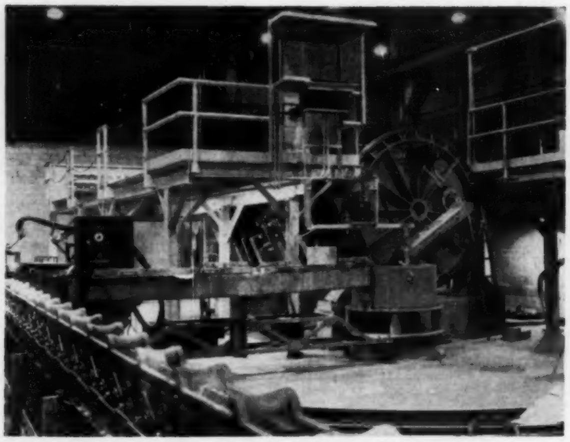

Fig. 5—Large Tama-Wyatt furnace set up for continuous casting of ingots. Easy cleaning is possible.

Fig. 6—Tapping heat from high frequency induction melting furnace of the Northrup type.

duplicated with precision in melt after melt with no rejects unless by operating carelessness.

Induction furnaces are clean and easy to operate. There are no waste gases or noises to contend with, and the operator can give his best attention to the work at all times. The heating energy is almost wholly absorbed by the metal in the furnace and little escapes to make for uncomfortable working conditions. Operation is simple and easy so that the melt is under full control at all times.

Comparison of Submerged Resistor and High Frequency Furnaces. The Wyatt and Tama-Wyatt submerged resistor furnaces operate at line frequencies, single phase for the smaller units and three phase for the larger units, and require no converter or motor generator as do the Northrup or high frequency furnaces. They should be, therefore, and are, less expensive than the high frequency furnaces, and their efficiency, for continuous operation, is higher. On the other hand they are not nearly as flexible as the high frequency furnaces.

Difficult Analysis Change

The submerged resistor furnaces usually are built for one particular metal or alloy and since a heel of molten metal must be maintained at all times it is not easy to change the analysis of the melt over any but the narrower ranges. These furnaces have found their widest application in plants operating on a 24 hour a day basis producing very large batches of metal of a single analysis. If operated for shorter than 24 hour a day periods the power required to maintain the molten heel of metal offsets the apparent efficiency to a point where in some instances the high frequency furnace is preferred.

Submerged resistor furnace linings are more critical and more expensive than high frequency furnace linings but generally last longer. Although some linings are being operated on cast or malleable iron at up to 2950 F, most of the furnaces are used for the nonferrous metals and alloys at considerably lower temperatures. Lining life is a function of metal melted, temperatures attained, operating cycle, and general overall care and maintenance.

The furnaces are started by preheating the lining, then preferably by pouring in molten metal. The shape and inaccessibility of the melting channels render them vulnerable to thermal shock, and to obtain long life it is essential that the furnaces be emptied and restarted as infrequently as possible. Lives of from a quarter of a million to ten million pounds of metal melted are historic but because of short lining life on certain corrosive alloys the author does not wish to make general statements which can be misinterpreted by possible users. Practically, however, it can be said that the linings are long lived as compared with high frequency furnace linings, a condition resulting largely because of the lower temperature metals melted.

Wyatt Submerged Resistor Furnace. Wyatt submerged resistor furnaces (Fig. 1) have been in use since 1911, and have made an enviable record, particularly in the wrought brass industry. They operate at a corrected power factor of 90 per cent or better, and have an efficiency on brass melting of from 80 per cent for a 24-hour day to 60 per cent for an 8-hour day (with 16 hours of holding time.) They are built in sizes from 60-1000 kw for copper and brass alloys, with holding capacities from 1200-20,000 lb and pouring rates of 500 to 10,000 lb per hr. Melting performance is from 8 to 10 lb per kwh with the lower figures for red brass and the higher figures for the lower melting point of yellow brasses.

Wyatt furnaces are used generally for melting copper, most of the common bulk lot brasses, cupronickel, nickel silver, manganese bronze, lead bronze, and like alloys. Products are billets and slabs for extrusion, tubing, sand castings, and the like. They are also used for melting zinc and zinc alloys for slabs and sheets, and zinc for galvanizing operations. In one instance they are used for maintaining a lead both at 1450 F for heat treating steel parts.

Wyatt Furnace for Gray and Malleable Iron Melting. A recent application for the Wyatt submerged resistor furnace is for melting cast and malleable iron. The furnace shown in Fig. 3, powered at 400 kw and holding 5000 pounds has a pouring rate of 1600 to 1800 pounds per hour or between 4 and $4\frac{1}{2}$ pounds per kwh. The furnaces operate 24 hours a day, six days

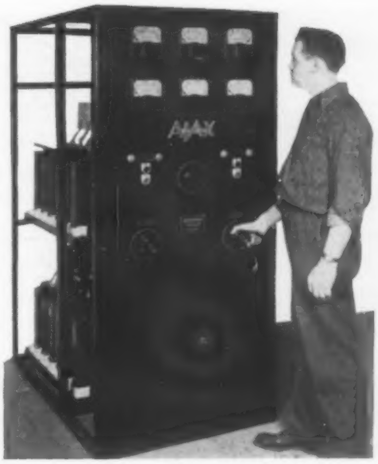

Fig. 7 (Left in photo)—Mercury-hydrogen spark gap connected for high frequency induction furnace. Laboratory size coil and crucible in foreground. Fig. 8 (right)—Typical high frequency induction furnace control panel.

a week, with one day hold over, and are relined on the average of once every two months. The charge is composed of mixed foundry scrap and pig, and the pouring temperature is 2850-2950 F. Holding power on the above unit is about 50 kw or 12 per cent of rated power.

Tama-Wyatt Submerged Resistor Furnace. The Tama-Wyatt furnace (Fig. 4 and 5) was first used in the United States about 1943. As its name implies it is a variation of the Wyatt submerged resistor furnace and was originally designed for melting aluminum and its alloys. The straight sided melting channels permit easy cleaning during operation and such deposits as collect in the lower channel may be removed when the furnace is shut down for repairs. Like the Wyatt furnace it operates at a corrected power factor of 90 per cent or better, and has an efficiency on brass melting of from 80 per cent for a 24-hour day to 60 per cent for an 8-hour day. For aluminum melting, its efficiency runs from 70 per cent for a 24-hour day to about 50 per cent for an 8-hour day.

The Tama-Wyatt furnace has been adopted throughout the aluminum industry and has been received widely also for bulk or large tonnage melting of brasses and copper. These furnaces are built in sizes for brass and copper melting from 50–1500 kw with holding capacities from 1500–40,000 lb and pouring rates of 400–12,000 lb per hr, or from 8 to 10 lb per kwh. For aluminum they are built in sizes from 20–1000 kw with holding capacities from 400–20,000 lb and pouring rates of 50 to 5000 lb per hr or about 5 lb per kwh. For zinc they are built in the same sizes as for aluminum with production at the rate of some 20 lb per kwh.

The Tama, like the Wyatt furnaces require the maintenance of a heel of molten metal between production runs and this requires some 15 to 25 per cent of rated power depending upon the metal being melted. Principal applications of the Tama-Wyatt furnaces are the casting of ingots and billets, die casting, automatic ladling for aluminum die casting, permanent mold casting, continuous casting, aluminizing, galvanizing, reclaiming zinc from dross and like applications.

Northrup High Frequency Furnace. The Northrup furnace (Fig. 6-10) is in its 38th year. It has nearly all the good characteristics of the submerged resistor furnace and countless other advantages. Except for a higher first cost and a slightly lower efficiency it would be the first choice for substantially all metal melting in the range from a few ounces to ten or fifteen tons of metal. It is by far the most flexible furnace ever developed. The higher cost and lower efficiency are introduced by the generator or converter needed to supply the high frequency power which most of these furnaces require. Only a few types can be operated at line frequencies.

Frequencies common for high frequency type induction melting furnaces are 1000, 3000 and 10,000 cycles as supplied by motor generators and from about 20 to 50 kc as supplied by the Northrup mercury-hydrogen type spark gap converters. Quenched spark gap and vacuum tube converters operating from 100 to 500 kc are widely used for induction heating applications but are not considered good generally for melting applications.

Converters and F.C.C. Regulations. The Federal Communications Commission has issued regulations covering spurious radiation in the field of frequencies over 10,000 cycles. The Northrup mercury-hydrogen type spark gap equipment (Fig. 7) is not a bad offender and only one complaint so far as is known, and that in error, has ever been made by the F.C.C. The interfering radiation from this equipment is far below the limit permitted under F.C.C. regulations and each Northrup type converter is certified as meeting all of the regulations.

Nearly every new alloy developed since 1916 began in one of these Northrup spark gap type converter installations. They are ideal for the development of a metallurgical idea or the founding of a new industry.

Versatility of the High Frequency Furnace. While the frequency changer and controls in high frequency furnace equipment add expense to an installation, the furnaces proper are relatively inexpensive and the basic equipment may be used for many different sizes or kinds of furnace or for other induction heating

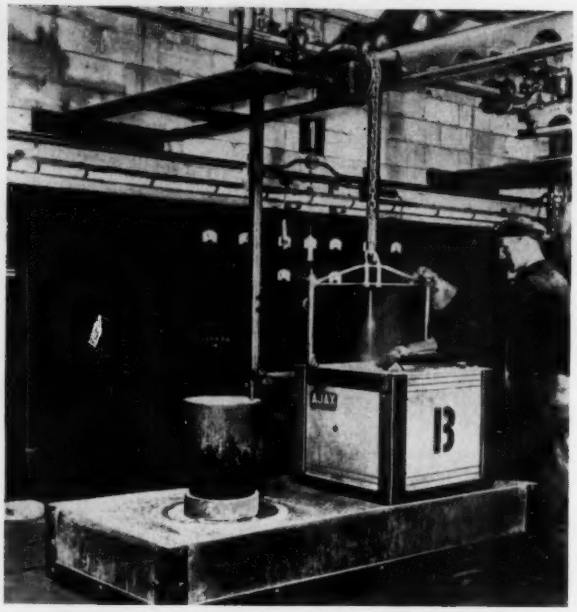

Fig. 9—The Northrup lift coil type furnace offers extreme flexibility in non-ferrous melting operation.

operations. In many laboratory or research installations the high frequency equipment is used for the whole gamut of applications.

In production work, melting and heating applications are rarely mixed, but many melting furnaces are designed to melt both ferrous and non-ferrous metals merely by changing the type of lining. Often too, several furnaces are operated from a single power source, either simultaneously through feeder control panels or alternatively from the principal control panel. In some cases feeder lines are drawn from a single large power source to operate a smaller auxiliary purpose or pilot furnace. Figure 8 shows a typical high frequency furnace control panel.

High Frequency Furnaces for Ferrous Melting. The high frequency furnace can be used for the widest range of melting applications, and it is used in substantially all such applications which can be justified economically. In ferrous melting, the field includes the high alloy steels, nickel, nickel alloys, resistance alloys, heat and corrosion resisting alloys, stainless steels, magnet steels, tool steels, carbides and the sintering and hot pressing of carbides, gray irons, malleable irons, the remelting of stainless steels and alloys, vacuum melting, powder metallurgy and research. In this field also might be included the cobalt, molybdenum, manganese, tantalum, titanium, vanadium, tungsten and silicon alloys. A five-ton furnace for melting nickel alloys is shown in Fig. 6.

Furnaces range from a few ounces to 6 or 7 tons in pouring capacity and are powered from 6 to 40 kw converters or 30-1250 kw or larger generators. In the production sizes it is generally assumed that 600 kw will melt one ton of steel in one hour, which is at the rate of about 3 to 3½ lb per kwh.

High Frequency Furnaces for Non-ferrous Melting. In non-ferrous work (Fig. 10) the principal applications are precious metal melting such as gold, silver, platinum and their alloys, the special or exact analysis brasses and bronzes (and other bronzes where for one reason or another the submerged resistor furnaces are not applicable), aluminum and its alloys but usually in specialty foundries, magnesium and magnesium alloys, uranium, and sometimes the zinc, lead, tin, antimony and cadmium alloys although usually these latter metals are melted in other furnaces.

Furnaces for non-ferrous work as for ferrous work are built in sizes from a few ounces to 5 tons and will melt brass at the rate of some 6 to 8 lb per kwh.

Tilting vs. Lift Coil Furnaces. Furnaces for brass melting are generally of two types, the tilting furnace of Fig. 10 and the lift coil type. The tilting furnace is a bit more efficient and pours a charge directly from the furnace into a transfer ladle or mold. The lift coil furnace has a free standing crucible which, after melting is completed, can be picked up directly in a shank and carried to a mold for pouring. Crucibles for the lift coil furnaces may be changed at will for different analysis melts which makes it extremely flexible and desired for general foundry work.

Fig. 10—Non-ferrous heat flares during tap from tilting high frequency furnace.

A No. 70 lift coil furnace powered at 100 kw will melt 200 lb of brass in a little over 20 minutes or at the rate of about 600 lb per hr. See Fig. 9.

High frequency furnaces are used in general for making ingots, sand castings, lost wax process castings, precision castings, shell mold castings, centrifugal castings, vacuum and pressure castings, die castings and for holding, pouring, alloying, mixing, and superheating metals. They are also used for a host of heating applications such as forging, hardening, and heat treating, which are not included in this paper.

Olivine-Silica Molding Sands

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Olivine and silica can be combined successfully in facings for silica sand molds according to tests made in casting steel. Written discussion of this AFS Convention paper, No. 54-77, should be sent to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill. The paper was presented at a Sand Session of the AFS 58th Annual Meeting, Cleveland, May 8-14, 1954.

■ Olivine and silica are superior refractory materials suitable for use in foundry molding sand. Olivine is a solution of forsterite ($2MgO{\cdot}SiO_2$) and fayalite ($2FeO{\cdot}SiO_2$) whose equilibrium system shows the fusion point of forsterite approximating 3470 F, while fayalite fuses in the vicinity of 2210 F. The temperature at which a given olivine will begin to fuse depends upon the ratio of its two constituents. Presence of impurities affects its fusion point adversely. Olivine generally selected for foundry sand has a fusion point somewhat above that of pure silica. Silica, a compound, has a fixed chemical composition and in its pure state will fuse at about 3142 F. Impurities in silica also have an adverse effect on its fusion point.

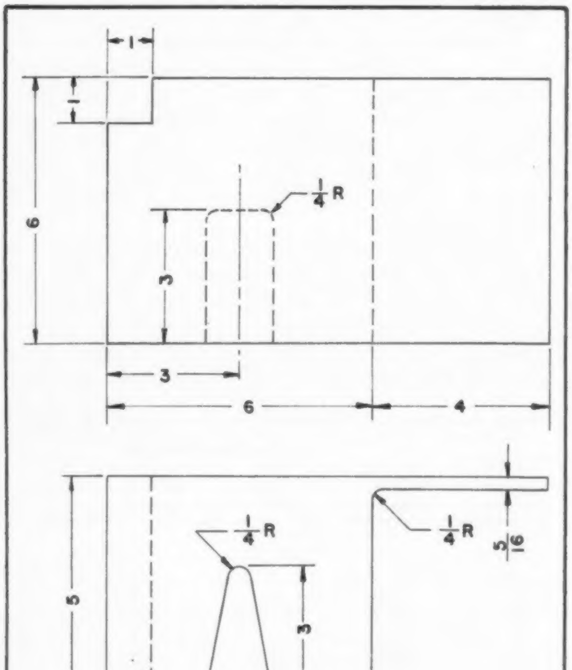

Fig. 1—Drawing of sand test casting, shown in inches.

The addition of olivine to silica sand will result in a fusion point lower than that of silica. The reverse is also true. The formation of clino-enstatite ($2MgSiO_2$) which begins to melt at 2840 F and softens at a lower temperature, can occur in olivine-silica mixtures under certain temperature situations. Iron present in the fayalite will tend to further lower this fusion point. These conditions indicate that contamination of olivine sand with silica or silica sand with olivine will lead to defective castings in a steel foundry because of the necessarily high pouring temperatures.

Sissener and Langum[1] have stated that in the steel foundry, contamination of olivine sand with silica should be avoided. In research at the University of Washington, great care has always been exercised to prevent the contamination of olivine sands with silica. In fact, all silica-base sands were removed at the beginning of the olivine project. The steel foundryman who is interested in trying olivine on a sample basis is not concerned with technical aspects such as the fusion point of clino-enstatite; rather, he is interested in knowing the results of contaminating his silica system sand with olivine. He is also desirous of knowing if any olivine-silica combinations could be used satisfactorily or to advantage.

Questions concerning mixtures of olivine and silica have been asked repeatedly by production foundrymen. The usual answer has been that, because of the formation of a low fusion point product, mixing olivine

Fig. 2—Drag pattern for test casting.

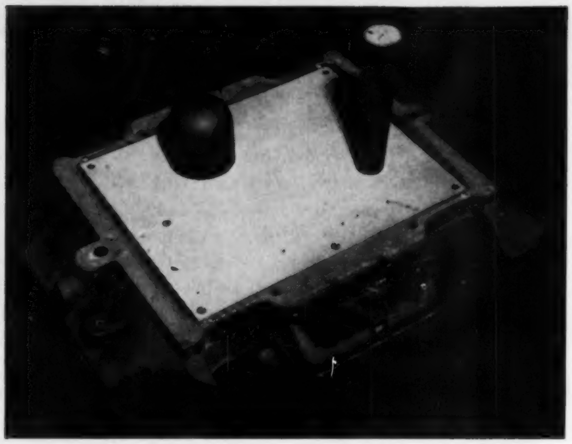

Fig. 3—Test casting cope rigged for molding.

and silica should be avoided by the steel foundries, although this would not be detrimental to iron or non-ferrous operations. This viewpoint needed qualification since the research project at the University of Washington concerned itself solely with olivine. Consequently, this paper presents the results of a beginning study to provide a more factual answer to the behavior of olivine facings and olivine-silica facings on silica sand molds in the steel foundry.

In this work, olivine and silica mixtures were used in three combinations. First, olivine flour was used to replace silica flour in a silica-base synthetic facing sand. The second combination used mixtures of silica and olivine aggregates. The third used a facing sand whose aggregate was entirely olivine but employed silica backing sand. In all cases the mixtures tested were used as facing materials only with the foundry's silica system sand being used for backing.

The following studies would not have been possible without the generous help of the management of the Washington Iron Works, Seattle, Wash. The unselfish assistance of John Butterfield, their foundry engineer, as well as their foundry staff and personnel is hereby gratefully acknowledged.

Equipment and Materials. The primary concern in this investigation was to determine whether or not silica-olivine molding sand mixtures would soften and develop swells or fuse at the mold-metal interface thereby producing castings difficult to clean. It was also important to determine if other casting defects would be accentuated or eliminated by the use of these mixtures.

The pattern selected for all of these studies was provided by the company; it is a pattern that has been used previously by the steel casting industry for investigating molding sands and mold washes.[2] The shape and dimensions of the castings produced from this pattern are shown in Fig. 1. It is obvious that this casting was designed to provide a searching test for molding sand behavior. Of special interest to this investigation is the heavy body of the casting which measures 6 x 5 x 6 in. and has a deep notch produced by green sand. Although the casting weighs only 50 lb, the sand producing the notch is treated as severely as it would be by a much heavier section. To obtain the maximum defect potential, a top riser was omitted, a blind side-feeder being substituted. Such molding procedure permitted a flat, uninterrupted cope area that would aggravate the conditions which tend to cause buckles and scabs. The pattern was mounted for ramming on jolt-squeeze-pin lift molding machines. The drag pattern as mounted on the molding machine is shown in Fig. 2, while the cope rigging is pictured in Fig. 3.

All materials used in this investigation with the exception of olivine sand and olivine flour, were drawn from the bins of the participating foundry. In order to guarantee uniformity, a sufficient quantity of each ingredient was drawn initially to serve the entire anticipated test program. The olivine materials were provided from the University of Washington research project.

The silica was a round-grained domestic sand originating in the Midwest. Its pyrometric cone equivalent was not determined but since it was a high purity silica it seems safe to assume its pyrometric cone equivalent to be 32. The screen analysis of this sand is given in Table 1. The silica flour was produced from western quartzite of high purity supplied to a minimum 200 mesh specification.

The olivine sand was crushed from rock mined at the Twin Sisters area in Washington State.[3] The sand had an angular grain and its PCE was determined to be 33. The screen analysis of this sand is shown in Table 1. The olivine flour was not prepared specifically for this purpose; rather, it was obtained as fines

TABLE 1—GRAIN DISTRIBUTION OF FACING MATERIALS

U.S.Std. Series Sieve No.	Per Cent Retained			
	Silica Sand	Olivine Fines	Olivine Sand A	Olivine Sand B
6	...	...	...	...
12	...	...	...	...
20	...	...	2.2	3.1
30	1.0	...	7.9	8.1
40	9.3	...	15.5	19.3
50	24.2	1.2	20.4	24.4
70	29.0	4.6	22.7	20.0
100	24.2	10.0	14.6	12.4
140	9.5	15.9	8.0	5.8
200	2.3	16.7	4.5	3.7
270	0.5	8.2	1.6	1.2
Pan	Trace	43.2	2.5	2.1
	100.0	99.8	99.9	100.1

separated from crushed material in the preparation of molding sand aggregate. The screen analysis of the flour also is shown in Table 1. These fines came from the same rock as the sand but showed a PCE value of only 30. This condition resulted from grinding contamination since flour produced later by a more suitable grinding process had a higher fusion point.

Procedures. Over a period of time, test castings were made once each week at the mutual convenience of the foundry and the authors. Each completed set of castings was carefully examined before planning facing mixtures for the following week. Through this procedure, it was hoped to obtain a maximum amount of information from a minimum number of castings.

These studies were initiated by using one of the foundry's green sand facing mixtures. Olivine flour was then substituted for silica flour and, as work progressed, other modifications were made. All subsequent mixtures can be regarded as modifications of the original facing sand formula. Each group of castings included one control casting. The sand used for the control casting contained no olivine materials. Such mixtures are identified by the prefix S in subsequent data, while mixtures containing olivine are labeled with the prefix O. The test procedures do not necessarily represent the most efficient methods of applying olivine-silica mixtures, further studies will be necessary in order to develop optimum results.

Sand Preparation. Sand mixtures were prepared in a small wheel-and-plow sand mill in the foundry laboratory. All dry materials were accurately weighed while water additions were measured by volume. The dry ingredients were placed into marked containers before mixing was started. The mill was on a schedule of two minutes of dry mixing prior to water additions with a total mulling cycle of 10 minutes.

The prepared sand was discharged from the mill into a marked container with a sample for test purposes being taken at that time. The prepared facing sand was covered with a damp cloth in order to prevent surface drying while other mixtures were being prepared. Samples were placed in sealed containers and were scheduled through the routine sand tests at the earliest opportunity. In most cases, samples were held for a maximum 15 minutes prior to testing. Tests were made for moisture content, permeability, and green compression strength. A second test sample was set aside for determining the pyrometric cone equivalent of the given sand mixture.

Molding. Molding procedures were standardized in so far as possible. Drag and cope were rammed simultaneously on identical jolt-squeeze-pin lift machines. One machine and operator was used each week to produce drags and another machine and operator regularly produced copes. Controls for jolt time and squeeze pressures were established and adhered to throughout the molding program. Facing sand was riddled into the mold through a six-mesh screen. Molds were closed as soon as they were finished to minimize air drying. A completed drag with the knock off feeder core in position is shown in Fig. 4.

Pouring. Finished test molds were placed together and poured in rapid succession with basic electric fur-

Fig. 4—Drag half of test mold with knockoff riser core shown in position for the pouring.

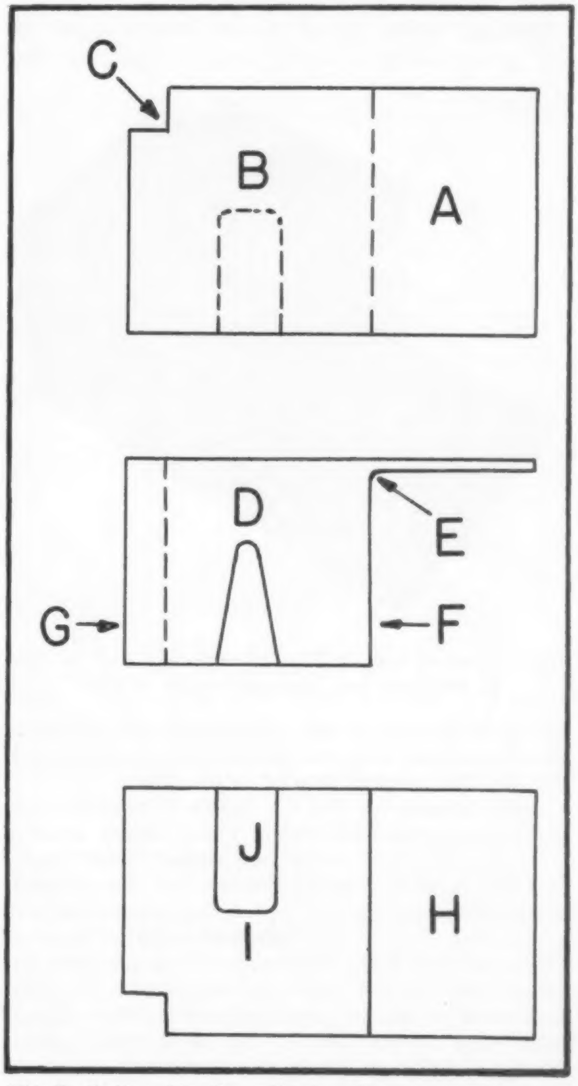

Fig. 5—Letters identify critical surfaces and fillets.

nace steel. Dry sand pouring cups were placed over the sprues and the molds were poured from a bottom pour ladle. Temperatures of the stream of metal leaving the ladle were read with an optical pyrometer. The static pouring head was 12 in. to the parting line and 17 in. to the deepest part of the mold.

Fusion points. The primary interest in this research was to determine the usefulness of olivine-silica mixtures in commercial steel foundry operations. It was decided, however, to determine the fusion point of some of the experimental facing mixtures in order to develop further background information. For this purpose, test cones were prepared from the sand mixtures following the standard procedure outlined in ASTM Designation C 24-46. The cones were tested in a Remey PCE furnace operating on the specified schedule for that equipment.

Cleaning and Inspection. Castings were cleaned at the foundry and delivered to the university laboratory for inspection. Sand that adhered to any casting after a light blasting operation remained intact and its removal was completed during inspection.

Data and results. Letter identification as shown in Fig. 5 was assigned to casting surfaces to facilitate dis-

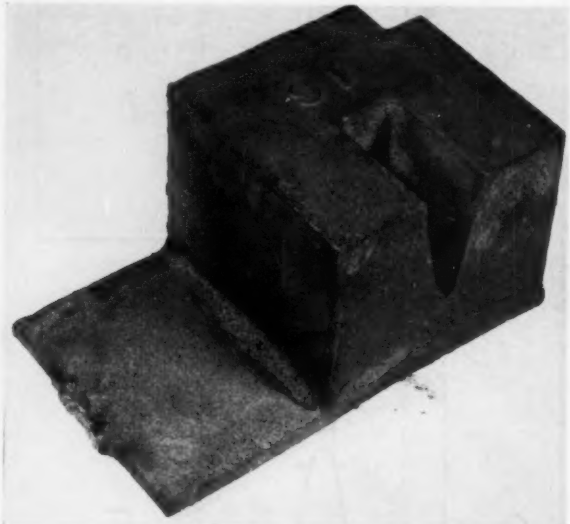

Fig. 6—Control casting S-1, showing large scab in fillet E. Moisture was principal variant in tests.

cussion of the results, since the seven groups of castings constituting this study will be examined in some detail. All pertinent data is detailed in the tables.

Sand mixtures S-1 and S-2 (Table 1) were the control mixtures used for Group 1 and Group 2; these mixtures were identical in composition except for the moisture content. The S-2 mixture had the preferred moisture content for this type facing material as generally used. Mixture O-1 substituted olivine fines for the usual silica flour. The weight of olivine flour was 25 per cent greater than the weight of silica flour because of the greater density of olivine. Only slightly more than 68 per cent of the olivine fines passed through a 140-mesh screen, therefore, the substitution is not an identical one. Mixture O-2 was similar to O-1 except for the increased addition of olivine to 15 per cent of the dry weight. In mixture O-3, on the other hand, the olivine fines amounted to 20 per cent on the basis of dry weight.

All of the castings poured from Group 1 and Group 2 sands, with the exception of S-1, would be regarded as acceptable by most commercial standards. Casting S-1 would be scrapped because of a scab extending almost the entire length of fillet *E*. The entire group of castings cleaned readily; sand did not fuse in notch *J*. Surface *H* was somewhat smoother on the S casting than on O series, while surface *I* was smoother on O castings. Vertical surfaces *F, D,* and *G* were slightly better on the O series of castings. Specimen castings S-2 and O-2 showed minute porosity on surface *G*, while casting S-1 had a very small scab on surface *G*. Casting S-1 is portrayed in Fig. 6 while Fig. 7 presents casting O-1. These views show the surface conditions typical of both groups of castings.

Table 2 indicates that sand mixture S-2, containing 8 per cent silica flour, had a PCE of 32. Mixtures O-2 containing 15 per cent and O-3 with 20 per cent of olivine flour, respectively, had PCE values higher than 30 but lower than 31. The addition of a maximum of 20 per cent olivine flour in silica sand lowered the fusion point approximately 63 F.

Scabbing behavior was intentionally encouraged in Group 3 by eliminating cereal and fireclay from all facing mixtures. The control mixture, S-3, carried 8 per cent silica flour whereas O-4 and O-5 carried 10 per cent and 20 per cent of olivine fines, respectively. No fusion or swelling was observed on any of these castings and adhering sand cleaned readily from notch *J* in all castings. Surface *I* was superior on casting O-5 and poorest on S-3. Casting O-5 showed some penetration and light scabbing on surface *H*.

The castings in this entire group produced scabs on surface *A* with casting S-3 developing the most unsatisfactory condition of this type of defect in the entire series of studies. The degree of imperfection on casting S-3 can be seen in Fig. 8 and 9. Less pronounced scabbing occurred on both O-4 and O-5 castings as noted in Fig. 10, a view of the O-4 casting.

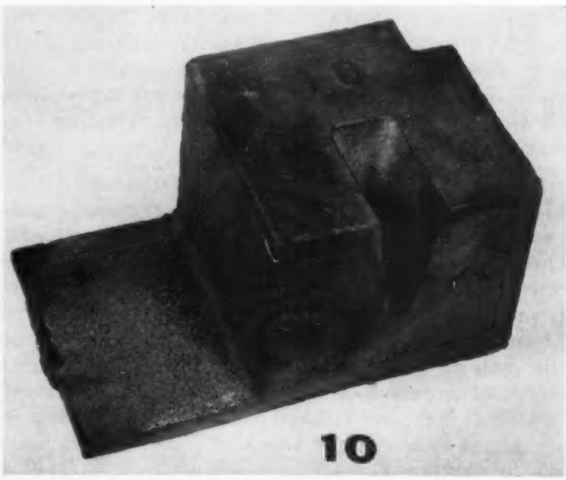

Fig. 7—Test casting 0-1 is typical of Group 1 and Group 2. Olivine fines were substituted for silica flour.

TABLE 2—MIXTURES FOR COMPARING OLIVINE AND SILICA FLOUR

	Group 1		Group2			Group3		
	S-1	O-1	S-2	O-2	O-3	S-3	O-4	O-5
Silica Sand, lb	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Silica Flour, lb	3.0	...	3.0	...	...	3.0	...	...
Olivine Flour, lb	...	3.75	...	5.75	8.10	...	3.75	8.10
Western Bentonite, lb	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
Fireclay, lb	0.75	0.75	0.75	0.75	0.75	...	...	...
Cereal, lb	0.21	0.21	0.21	0.21	0.21	...	...	...
Dextrin, lb	0.09	0.09	0.09	0.09	0.09	0.18	0.18	0.18
Water, %	4.2	4.1	3.8	4.0	4.3	3.8	4.1	3.6
Permeability	100	100	100	100	74	90	100	80
Green Comp, psi	10.3	9.6	9.5	9.1	8.8	8.0	7.5	7.8
Mold Hardness	80-83	80-85	77-82	80-85	80-85	...	...	...
PCE	...	...	32	30-31	30-31	...	...	...
Pour Temp, F	2800	2800	2840	2840	2840	2790	2790	2790

TABLE 3—MIXTURES FOR COMPARING EFFECTS OF IRON OXIDE

	Group 4				Group 5			
	S-4	O-6	O-7	O-8	S-5	O-9	O-10	O-11
Silica, lb	30.0	30.0	30.0	30.0	29.93	29.23	29.23	25.73
Silica Flour, lb	3.0	...	...	...	2.80	...	...	...
Olivine Flour, lb	...	3.75	8.10	3.75*	...	3.50	3.50**	7.00**
Western Bentonite, lb	1.65	1.65	1.65	1.50	1.00	1.00	1.00	1.00
Fireclay, lb	...	...	...	...	1.00	1.00	1.00	1.00
Cereal, lb	...	...	...	...	0.18	0.18	0.18	0.18
Dextrin, lb	0.18	0.18	0.18	0.18	0.09	0.09	0.09	0.09
Water, %	3.0	3.2	3.0	3.3	3.7	3.8	3.9	4.0
Permeability	90	100	75	90	80	90	80	54
Green Comp, %	7.4	7.7	7.5	8.1	7.5	7.7	8.0	8.6
Mold Hardness	75-82	76-83	75-83	80-85	80-85	79-85	82-85	80-85
PCE	...	...	...	...	...	...	31	30
Pour Temp, F	2820	2820	2820	2820	2820	2820	2820	2820

** Olivine flour with red iron oxide additions.
* Olivine flour mix prepared from olivine flour, 9.0 lb, iron oxide, 1.0 lb and furnace oil, 5 cc, mixed 10 min.

TABLE 4—SILICA-OLIVINE FACING SANDS

	Group 6				Group 7		
	S-6	O-12	O-13	O-14	S-7	O-15	O-16
Silica, lb	30.0	15.0	7.50	...	30.0	...	...
Silica Flour, lb	3.0	...	...	...	3.0	...	...
Olivine Sand, lb	...	18.0	25.50	33.0	...	33.75	33.75
Western Bentonite, lb	1.65	1.65	1.65	1.65	1.65	1.65	1.00
Fireclay, lb	0.75	0.75	0.75	0.75	0.75	...	...
Cereal, lb	0.21	0.21	0.21	0.21	0.21	...	0.18
Dextrin, lb	0.09	0.09	0.09	0.09	0.09	0.18	0.18
Water, %	3.9	3.9	3.8	3.8	4.0	4.4	4.0
Permeability	100	130	130	140	100	180	160
Green Comp, psi	9.8	10.4	11.5	12.4	9.6	10.4	7.0
Mold Hardness	80-84	82-88	80-85	84-86	...	...	...
PCE	...	19	19	...	...	...	...
Pour Temp, F	2870	2870	2870	2870	2840	2840	2840

In Group 4 (Table 3) the sand mixtures were similar to those of Group 3 except for sand O-8. The fines addition in the latter mixture was prepared by mixing nine parts by weight of olivine fines with one part of red iron oxide. A laboratory sand mill prepared the mixture in which a 0.1 per cent addition of furnace oil was made as a preventative against dusting-out. The moisture content was reduced in these sands to determine whether scabbing could be eliminated this way.

Surface conditions on these castings were similar to those of Group 3 except for surface *H* which was consistently rougher than the previous series, with some cutting and penetration evident. The sand mixture containing 20 per cent olivine fines produced castings that were extremely rough on this surface although other surfaces were satisfactory. Notch *J* surfaces were slightly better than previous castings. However, mixture O-8, containing iron oxide, sintered slightly in the notch and was more difficult to remove. The black oxide layer at the mold-metal interface blasted off easily and the surface of the notch, once it was cleaned, was superior to other castings of this group. The remaining casting surfaces revealed no improvement with this sand mixture.

Cope scabbing was not entirely eliminated but it was greatly reduced in casting S-4 and O-6 in comparison with their counterparts in Group 3. The scabbing tendency of O-7, containing 20 per cent olivine fines, was slightly improved but the scabbed area was several times greater than that of casting O-6 produced in sand containing 10 per cent olivine fines. The scab area of casting O-8, which was molded with sand containing iron oxide, was slightly greater than that of casting O-7 making it the largest scab of the group.

Equal amounts of western bentonite and fireclay

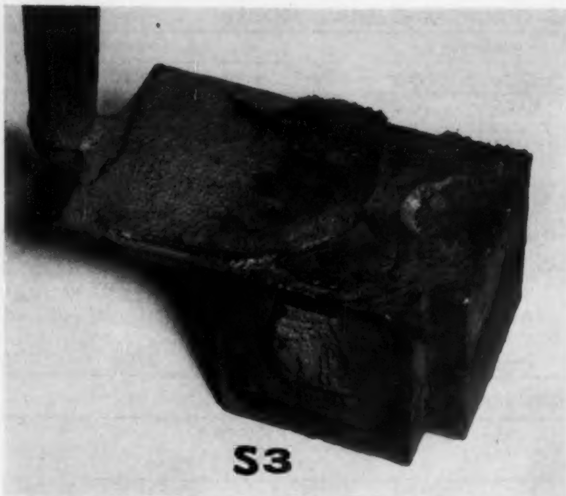

Fig. 8—Severe scabbing on top surface of this S-3 casting, most severe of series, was created intentionally.

were added to Group 5 (Table 3) sand mixtures. Total clay content was 5.7 per cent in contrast to 6.7 per cent total clay of the original mixture S-1. Cereal in 0.5 per cent amounts was re-introduced, this percentage being slightly less than in the original mixture. Sand mixtures O-10 and O-11 contained olivine flour that had been blended with 3 per cent red iron oxide.

The surfaces of these castings proved to be uniformly good. Sands containing olivine fines sintered to a greater degree than similar sands in Groups 1 and 2 but they cleaned easily and produced better surfaces than their counterparts in earlier groups. A wash defect occurred on surface *H* of casting O-11. Cope scabs occurred on all specimen castings of this group. The scab area of the control casting was greater than that of any of the O castings.

The fusion point of sands O-10 and O-11, which carried small percentages of iron oxide, was determined. The oxide addition did not affect the fusion point in any noticeable degree.

The control casting sand S-6 in Group 6 (Table 4) was similar to the original facing mixture. The aggregate of sand mixture O-12 contained 54.5 per cent silica sand and 45.5 per cent olivine sand. The olivine grain size is shown in Table 1 under the heading Olivine A. The sand aggregate for mixture O-13 contained 77.5 per cent olivine sand and 22.5 per cent silica. The aggregate for facing mixture O-14 consisted entirely of olivine. The increase in green strength resulting from increased olivine additions is an effect that can be expected from an angular grain.

Fusion Points Determined

The fusion point of sands O-12 and O-13 was determined to be PCE 19. This temperature is approximated 150 F lower than the pouring temperature of the steel for this group. Severe penetration occurred in notch *J* in all specimen castings. The penetration into the more permeable O mixtures was greater than in the control mixture S-6. Surface *A* of the control casting proved to be extremely rough but other surfaces were entirely satisfactory. However, the general surface condition of all O castings of this group was unsatisfactory. In every case they were considerably rougher than any of the previous castings.

The control casting developed a small gate scab as well as a series of small scabs along fillet *E*. The remainder of the group was completely free of scab defects.

The control mixture in Group 7 (Table 4) was again similar to the original facing mixture. Sand mixture O-15 was free of fireclay and cereal. In this respect it was similar to mixture O-4 except that it contained no silica aggregate whatever. In sand mixture O-16, fireclay was omitted and the bentonite content was reduced to 2.75 per cent to reduce the green strength. The grain distribution of the aggregate is shown in Table 1 under the heading of Olivine B.

The control casting, S-7, had reasonably good surfaces but scabbed along fillet *E* and in notch *J*. Casting O-15 revealed greater surface roughness than the control specimen, a condition to be expected because of its greater permeability. This casting further developed severe metal penetration in notch *J* similar to the condition in Group 6. It is interesting to note, however, that unlike similar mixtures with silica aggregate, no scabbing occurred. The general surface smoothness of casting O-16 was somewhat better than that of O-15. Metal penetration in notch *J* was not extensive. This casting developed a rather pronounced scope scab on surface *A;* the studies did not include a silica aggregate counterpart for comparison since a low total clay content was not used in any other mixture.

Conclusions. The results of these studies indicate that olivine flour can be used successfully for controlling the properties of silica based synthetic sand. The fusion point of the sands controlled with olivine flour was lowered. However, with additions up to 20 per cent the fusion point remained sufficiently high to make it possible to pour large steel castings in molding material of this type. An accumulation of olivine fines could conceivably create a problem, but it is doubtful if any steel foundry would allow the fines content of its system sand to reach 20 per cent.

A noteworthy development was that the black scale formation on the casting surfaces was consistently thinner when olivine fines replaced silica flour. On this basis it might be predicted that the cleaning cost of large castings would be reduced through the use of olivine flour. This presumption cannot be fully accepted, however, until such castings are produced and cleaned under controlled conditions.

Several mixtures were compounded for the definite purpose of creating scabs on the test castings. In many cases, sands containing olivine flour scabbed to a lesser degree than those containing silica flour; however, this was not consistently true.

Sands containing 20 per cent olivine flour usually showed larger scab defects than sands with 10 per cent flour. One interesting trend was noted throughout the test program: sands with olivine flour were less sensitive to moisture variations than sands with silica flour. When the control sands containing silica flour were tempered on the wet side, they scabbed to a

much greater degree than similar mixtures containing olivine flour. However, when these sands were tempered on the dry side the control sands showed remarkable improvement and usually were equal to and in some cases superior to their olivine counterparts. These studies have not been searching enough to establish this unusual observation as fact. There is insufficient evidence to state at this time that the use of olivine flour as a replacement for silica flour is beneficial in reducing scab formation.

Low Fusion for Facing Sands

The facing sands used in these studies which were compounded from mixtures of olivine and silica aggregates developed a rather low fusion point by PCE test. This result does not necessarily imply that steel castings could not be made in these sand mixtures since the conditions under which a pyrometric cone equivalent is determined are not at all parallel to those in a mold during the pouring and cooling cycle. Castings made from these sands exhibited unacceptable surfaces; however, fusion was not evident. The rough surfaces appeared to be a result of improper grain size and dry strength. Inspection of the castings indicated that increased moisture content in the sands would improve the surface condition, a premise that proved to be correct in a later study.

Work with this type of mixture was very limited and on the basis of present knowledge this type of sand cannot be recommended for steel facing mixtures even though castings were produced without visible fusion.

It is significant, that in these studies, satisfactory castings were made when the facing sand aggregate consisted entirely of olivine sand and the backing material was silica system sand. The junction of these sands in the gating system did not result in slag formation. The use of olivine facing sands would reduce the amount of buffer materials needed to prevent scabbing. This use of olivine would also eliminate silica dust that normally results from chipping, grinding, and blasting operations. Full advantage of the high fusion point and uniform thermal expansion would be utilized by this molding procedure. The continued use of this method would result in a system similar to the mixed aggregates described in this paper.

Olivine and Silicosis

The effect of silica material of fine particle size has been the subject of considerable medical research. In seeking a means of preventing silicosis, several investigators have studied the behavior of olivine on the respiratory systems of animals in order to evaluate its potential as a replacement for predominantly silica materials. The result of this experimentation indicates that "only a minimal reaction of foreign body type appears to be produced".[4] Since silica fines are prominently used in steel foundry facings, it seemed that further knowledge of olivine-silica sand mixtures is important to both hygienic and technical foundry progress. The studies reported in this paper were undertaken with the view of evaluating olivine-silica mixtures. The results obtained indicate that olivine is capable of a performance that can well lead to its adoption by the steel casting industry.

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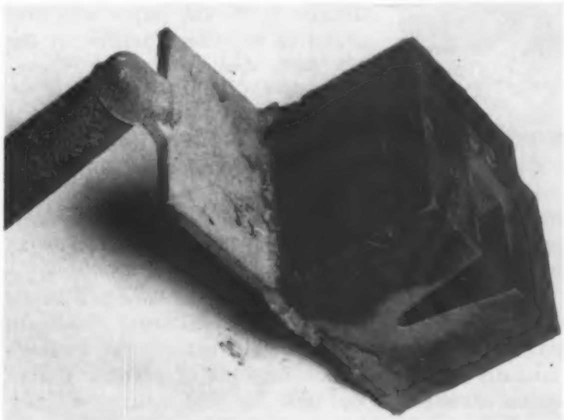

Fig. 9—Drag side of casting S-3 (see Fig. 8) also shows scabs. Adhering sand cleaned poorest from this casting.

Fig. 10—Less pronounced scabbing was evident in this casting, made in sand with 10 per cent olivine fines.

Experiences With Plastics in Patternmaking Practice

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W. C. H. Dunn

Plastics can be used for patterns, core boxes, and for coating wood patterns to achieve wear resistance. Written discussion of this Convention paper, No. 54-90, should be sent to AFS, 616 S. Michigan Ave., Chicago 5, Ill. The paper was presented at a Pattern Session of the AFS 58th Annual Meeting, Cleveland, May 8-14, 1954.

■ It is the patternmaker's responsibility to keep himself informed on all new pattern methods and materials, and to convey to the foundryman any ideas that may improve foundry techniques. Thus, old fashioned methods are the exception rather than the rule in pattern shops today.

With this in mind, and with the idea of producing and duplicating patterns and mounting them on plates in the most economical manner, the author's company decided to look into use of plastics. Use of plastic materials is not new. In 1868, when the shortage of ivory hit the billiard ball trade, celluloid was born. Thrift-minded men wore shirts with detachable celluloid collars and cuffs which they removed at night and sponged clean.

Celluloid remained the only member of the plastics family for 41 years. In 1909, the first heat and break-resistant plastic materials were discovered and promptly became pot handles and telephone sets. This was the beginning of two distinct branches of the plastic family, the thermosetting and the thermoplastic branches.

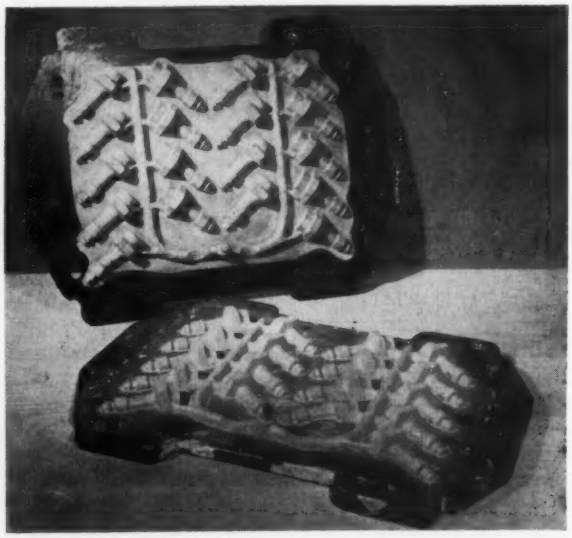
Between 1909 and 1926 two more plastic materials joined the growing family. One was for industrial use only. The other, which was made from skim milk, became buttons, buckles, beads, and knitting needles, and belongs to the heat-sensitive thermoplastic branch. From 1926 on, the plastic family began propagating at a great rate. New materials were born to both branches of the family almost every year. Recently, the chemical setting plastics branch has been added.

Although plastics were used in other industrial fields at an early date, it wasn't until 1940 that use for them was found in the pattern field in a cast form. They have been used since in both United States and Canada in small, medium, and large foundries and have proved extremely satisfactory. They have not been used more extensively because there was a shortage of resins during the war.

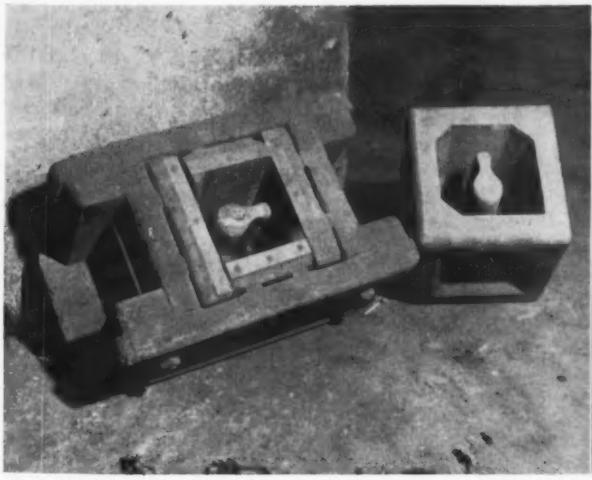
Phenol Formaldehyde Superseded

Until recently phenol formaldehyde was widely used because it had impact hardness, strength, absorbed shock, and had other desirable properties, but this has now been superseded to great extent by epoxy resins. The latter are used as laminates; they have adhesive characteristics and can bond to aluminum, iron, brass, or wood, one advantage over the phenol.

Organic plastics may be divided into three general groups on the basis of their behaviour towards heat. These general divisions are thermoplastic, thermosetting, and chemical setting. Thermoplastic types remain soft under heat and must be cooled before they



Cope and drag plates for valve bonnets were duplicated from wood patterns which had tested for accuracy. Plastic was poured directly into metal frame.



(Left) Wood and plastic (at right in photo) boxes for core approximately 10 in. square and 12 in. deep. Plastic permitted use of minimum draft, thus eliminating loose pieces. (Right) Plastic pattern was cast in aluminum frame, duplicating existing loose pattern without resultant dimensional change.

will become hard or rigid. Even after cooling and hardening, thermoplastics may be softened and worked by re-heating.

Thermosetting compositions are transformed into hard infusible products when properly heat treated or cured. They are soft or liquid when first heated, but rapidly assume a permanent and rigid state as chemical changes take place in the binder. This is the type of plastic used in casting patterns, because once set, its form is permanent and rigid; it has dimensional stability, durability, and controllable shrinkage, together with other advantages. The chemical-setting plastics are those which are set or hardened by the addition of a suitable chemical agent.

Plastic Techniques

Once a knowledge of plastic technique and handling is acquired and properly applied to pattern reproduction, the manufacturing process is relatively simple. In the case of pattern duplication, a plaster mold is made, using the original pattern. A low-expanding, non-shrinking plaster is used. It is extremely important that the plaster mold be clean and sharp in every detail, as the reproduction will only be as true as the mold in which it is cast.

After the plaster has dried thoroughly, the cavity is coated with an acid-resistant paint. Just before pouring the plastic, wax is applied to make parting easier. The resin is then prepared and catalyst is added in proportions according to directions, depending on the make used and on the thickness of the casting. It has been found that the thicker the section, the less catalyst needed.

After the material is thoroughly mixed, it is poured into the mold; rate of pouring must be slow to allow all air to escape. Molds are left to cure at room temperature for four or five hours, depending on the type of castings, and are then placed in an oven overnight at a temperature of 140 to 160 F.

When the castings have been properly cured, they are removed from the oven. Care must be taken not to remove a casting from the mold before it has reached room temperature. Depending on the finish required, castings may be sanded with waterproof sandpaper or steel wool and water, which will bring up a high luster.

Definite techniques produce definite results. No amount of written matter will teach these factors to anyone, for only by practical experience are these materials handled successfully.

Several advantages are claimed for plastic patterns. Drawing qualities are good because of the close-grained surface smoothness and because no reaction occurs with hot sand. Plastics are low conductors of heat, thus avoiding condensation on the pattern. Less vibration is required for drawing, and better molds result from the easier draw.

Physical properties of a cast plastic are:

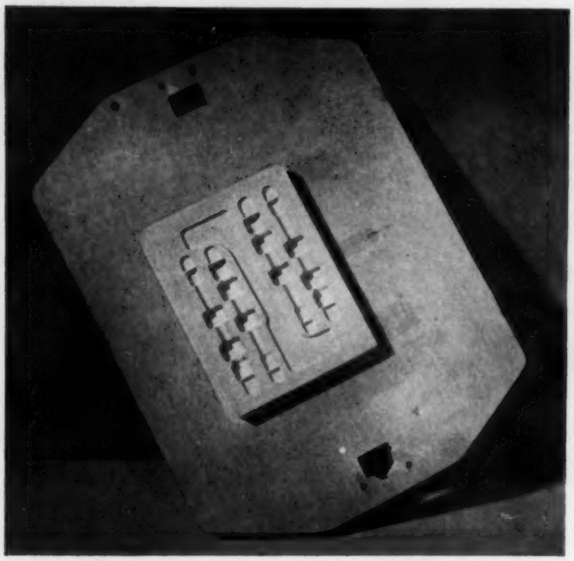
Impact Strength	1 ft lb (ASTM Izod)
Specific Gravity	1.3 (approx. ½ that of aluminum)
Flexural Strength	10,000 psi
Water Absorption	0.4% in 24 hr
Compressive Strength	16,000 psi
Rockwell Hardness	115 (R scale)

The plastic can be drilled, tapped, jig bored, sanded, scraped, milled, and so on. It is impervious to water, acid, and oils.

Excellent Armor Coating

The author has used a phenol formaldehyde as an armor coating on large wood patterns for truck and side frame steel castings with wonderful results. Time and money have been saved in minimizing repair and replacements due to wear from slingers. The material is also excellent for core boxes that are blown, making them smaller and easier to handle.

The phenolic casting resin has considerable durability, but it may chip if projections are struck with a metallic instrument. Such a chip may be repaired or a pattern change made with a patching material which handles like modeling clay, forms a virgin bond with the original pattern, and will harden in eight hours at room temperature or in 20 minutes under an infra-



Plastic pattern for drier was poured directly into plastic-coated plywood board (above).

Pattern for steel truck frame for diesel engine used in 10 x 14-ft flask. Ribs were made of phenol formaldehyde plastic and wore little after three months' hard use.

red lamp. When set, the patching material may be worked with tools in the same way as the original plastic.

Plastics Prove Flexible

Plastics lend themselves to many fields, including foundry patterns, core boxes, checking fixtures, holding fixtures, and stretch-press and hydro-press dies; all are dependent on the skilled master patternmaker and his products for the tools to make cast plastic duplicates. Plastics for production of patterns have as many applications and possibilities as wood, aluminum, or any other material. In fact, plastics can be used even more widely than wood or aluminum; compared with wood, plastic patterns are stronger, dimensionally more stable, and free from warpage.

Considering that more than 50 per cent of the patterns in foundries today are wood patterns mounted on boards or metal plates, or handled as loose patterns in the foundry, the future for plastic patterns is bright. They will continue to open great opportunities to the patternmaker and the foundry. The use of plastics for loose patterns, matchplates or cope and drag plates has advanced far past the experimental stage. Nevertheless resistance against the use of plastics for patterns is still strong in the average patternmaker. This resistance derives from inexperience in the handling of plastic patterns, as well as from lack of know-how in producing them.

Methods in some foundries have changed to keep pace with production demand. Loose wood patterns can no longer meet the demands of modern foundries; the patternmaker must therefore follow suit and produce the necessary equipment. This production equipment can be produced in metal at high cost, or in plastics, where applicable, at relatively low cost. A low-cost plastic production job does not necessarily lower the quality of the equipment.

Superior to Aluminum

In many cases plastics have proved to offer better service and longer life than aluminum. Less scrap and grinding plus higher production in the foundry have resulted from the use of plastics for production patterns. Among the many outstanding advantages inherent in the proper use of plastics are the following:

1. Low-cost duplication of patterns through repeated use of the plaster mold for casting plastics.
2. Elimination of finishing requirements, because plastic castings are smooth and dense.
3. Plastic castings are identical with the master pattern.
4. Patterns can be duplicated without shrinkage compensation.
5. Smooth, accurate draws are obtained with plastic patterns because sand does not adhere to them.
6. Draft can be eliminated.
7. Minimum surface wear is assured. Tests show wear to be less than that of aluminum.

The first patterns mounted by Western Pattern were done according to the Schumacher process and were mounted on a plastic-coated ¾-in. board. Since then the company has found that adding a suitable filler to the resin eliminates what little shrinkage there was. Patterns large as 24 x 60 in. have been duplicated without dimensional change. With the shrink problem overcome, it is possible to cast directly into a plywood board for short runs. Patterns mounted in accordance with this method have withstood the test of 10,000 or more molds. However, when a jolt machine is to be used it is necessary to mount the plastic in an aluminum or cast iron frame.

This non-shrink material is also ideal for making core boxes and driers. When a number of driers are to be made, a plastic matchplate is made up with masters for the driers allowing for aluminum or iron shrinkage, depending on what the driers are to be made of. The driers are cast first, then one drier cleaned up, and a plaster taken from it. Several plastic core boxes are then made. It has been found that making up core boxes and driers in this way has proved extremely satisfactory, with a minimum of labor being required.

Credit is due the AFS Patternmaker's Manual for some of the above information.

Calculating Cupola Changes

This description of cupola charge calculation is taken from the revised edition of The Cupola and Its Operation just released by American Foundrymen's Society. Chapter numbers mentioned refer to sections in this new, over 300-page, 8½ x 11-in. book.

The principal objective of good cupola operation is the economical production of iron having a composition suited to the section sizes involved, the purpose, of course, being to develop the desired physical and mechanical properties at a quality level commensurate with the type of castings required. The two chief factors leading to this desired end are the raw materials entering the cupola and a knowledge of how the cupola operation affects the chemistry of the charge. To begin with, therefore, it is highly desirable to know, insofar as is practically possible, the chemical constitution of the materials in the charge, that is, the metallic constituents, the coke, and the fluxing materials.

In comparison with the other main metallic raw materials, the composition of pig iron, as furnished in the designated grades, is reasonably well known and controlled, with the possible exception of its carbon content. However, it is advisable to check the shipper's analysis at a frequency commensurate to satisfy the needs. The composition of return scrap and gates is obtained from daily laboratory records of analysis. A knowledge of the chemical constitution of purchased scrap presents by comparison a formidable problem, particularly since for economic reasons it usually is necessary to employ the maximum percentage of this material without impairing chemical control of the molten metal. The general approach to the problem lies in: (1) insisting upon uniformity of a given delivered lot by the supplier; (2) careful inspection coupled with rejection of the shipment if not conforming to specifications; (3) additional segregation when feasible in the process of unloading; and (4) a reasonable knowledge of the average composition of the finally sorted materials.

After a period of training in the recognition of various types of scrap, crane operators and charging crews can offer an invaluable contribution to cupola control, as they see practically every piece of iron used during the course of operation.

Pig iron, described in Chapter 26, is available in any desired silicon analysis up to about 4.00 per cent, together with a wide selection of manganese and phosphorus. High silicon silvery pig iron contains from about 7 to 17 per cent silicon. Purchased scrap, described in Chapter 27, includes gray cast iron; malleable cast iron; steel in the form of castings, plate scrap, railroad rails, rail fittings, structural scrap; and briquetted turnings and borings of both cast iron and steel. Home scrap consists of sprues, heads, gates and risers from one's own plant. Fluxing stone, fluorspar and soda ash are described in Chapter 30. Limestone and dolomitic limestone should never contain less than 95 per cent calcium carbonate plus magnesium carbonate. The ferroalloys, described in Chapter 28, are available in lump or pig form, as briquets for melting with the cupola charge, or in ground and shot form for spout or ladle addition.

Some alloys are bonded into briquet form with exothermic materials that melt the contained alloy in the ladle. Special analysis pig irons and silvery pig irons contain various alloys for use in the cupola charge. Home iron and steel scrap, as well as purchased iron and steel scrap, may contain useful amounts of alloy. Coke is described in Chapter 29.

The classifications in Table 1 follow the grading specifications of cast iron and steel scrap as described in Chapter 27. The analyses are approximations only but will serve as a guide for mixture making.

In estimating the analysis of scrap each pile should be considered separately giving consideration to such factors as the class of casting and, if possible, the producer. Age is a factor, since in recent years the use of alloys has increased steadily.

The loss or gain of elements, melted according to current good cupola practice, is expressed in Table 2 as a percentage of the weight of each element charged, e.g., assume a mixture in which the charge contains a 2.50 per cent of silicon. With a 10 per cent

Continued on page 86

TABLE 1—APPROXIMATE ANALYSIS OF CAST IRON AND STEEL SCRAP

Type Scrap	Si, %	TC, %	Mn, %	P, %	S, %	Cr, %	Ni, %	Mo, %	Cu, %
No. 1 Machinery Cast; No. 1 Cast	2.10	3.25	0.60	0.50	0.10	0.05	0.05	—	—
Textile Machinery	2.40	3.40	0.75	0.20	0.12	—	—	—	—
Automotive Cast	2.25	3.30	0.75	0.15	0.12	0.25	0.10	Tr	0.15
Agricultural Scrap	2.25	3.40	0.60	0.30	0.12	Tr	Tr	—	—
No. 1 R.R. Cast	2.15	3.30	0.60	0.40	0.10	—	—	—	—
No. 2 R.R. Cast	1.90	3.20	0.60	0.35	0.10	—	—	—	—
No. 3 R.R. Cast	1.25	3.10	0.70	0.30	0.10	—	—	—	—
No. 1 Radiator Scrap; No. 2 Radiator Scrap	2.30	3.45	0.55	0.55	0.10	—	—	—	—
Brake Shoes	1.15	3.10	0.40	0.50	0.20	—	—	—	—
R.R. Car Wheels	0.55	3.50	0.55	0.30	0.13	—	—	—	—
No. 1 Malleable Scrap; No. 2 Malleable Scrap; R.R. Malleable; Agricultural Malleable	0.95	2.30	0.40	0.15	0.10	—	—	—	—
Rails	0.25	0.60	0.80	0.05	0.05	—	—	—	—
No. 2 Steel-Auto	0.10	0.30	0.70	0.03	0.03	0.15	0.20	Tr	Tr
Structural Steel*	0.05/0.75	0.12	0.20/1.20	0.03/0.12	—	0/0.80	0/1.80	0.10/0.25	0.1/0.9

**Metals Handbook*, 1948 Edition, p. 534.

Calculating Cupola Changes

(continued from page 85)

silicon loss in melting, the estimated analysis of the iron at the cupola spout is 2.25 per cent silicon, i.e., 2.50— (10 per cent of 2.50) = 2.25.

While Table 2 may be used as a guide in mixture making, experience will establish the loss of elements during melting for a particular operation. Once established, these loss figures should be used.

One method of calculating the charge is as follows: The average composition of the ingoing charge, based on the respective weights (or percentages) and chemical compositions of the various metallic components used, is determined. Then the losses (or gains) as indicated are subtracted (or added). The results obtained at this point should give a close approximation of the percentages of silicon, sulphur, manganese, and phosphorus (also alloys if any were present in the charge) to be expected in the iron at the cupola spout. Usually there is a carbon pickup in melting. Carbon control is discussed in Chapter 9.

Table 3 represents a convenient way of figuring the cupola charge. The procedure followed is self-explanatory, with the possible exception of the line concerning "Melting Loss or Gain." The carbon pickup of 0.30 per cent represents the increase in carbon during melting, based on experience with a particular melting practice. Silicon and manganese losses were calculated at 10 and 20 per cent, respectively, of the percentages of these elements in the charge ("Analysis Charged"). The increases in sulphur and phosphorus are in accordance with figures given in Table 2.

It so happens that the cupola mixture in question was calculated on the basis of "weights" of the various components used. However, the calculation could just as well have been made on a "percentage" basis, the method to be used being dependent on the preference of the person making the calculation.

Careful attention should be given the layout of storage facilities to promote ease and economy of handling. All pig irons, silvery irons, each of the various grades or classes of purchased scrap, either cast or steel, home scrap, with and without alloys, as well as any special or unusual type of material, should be kept separated on the storage yard. Unless this is done with care, the efforts of the party responsible for calculating the cupola charges will be wasted.

In addition, the bins used for the storage of the metallic components of the charge, as well as those used for coke and limestone, should be emptied and cleaned at regular intervals. During these clean-up periods, non-metallic materials such as sand, cinders and other trash should be removed from the iron bins, and foreign material and fines should be removed from the coke and flux bins. Obviously, large quantities of foreign matter in the iron bins which find their way into the cupola charge have the same effect as inaccurate weighing, and this, in turn, may often result in poor uniformity of composition of the metal at the cupola spout.

TABLE 2—APPROXIMATE LOSS OR GAIN OF ELEMENTS IN MELTING

Element	Per Cent Loss	Per Cent Gain
Silicon, in pig and scrap	7-12	—
Lump ferrosilicon	10-15	—
Manganese in pig iron and scrap	10-20	—
Lump ferromanganese	15-25	—
Spiegeleisen	15-25	—
Phosphorus	—	Trace
Lump ferrochromium	10-20	—
Nickel, shot or ingot	2-5	—
Copper, shot or $\frac{3}{16}$ and thicker scrap	2-5	—
Alloys in briquets	5-10	—
Sulphur	—	40-60

TABLE 3—DAILY MIXTURE CALCULATION SHEET

Mixture No. 11 | Heat No. 9 | Cupola No. 2 | Date 12/14/53

Material Charged	Per Cent	Pounds Per Charge	Carbon %	Carbon lb	Silicon %	Silicon lb	Manganese %	Manganese lb	Sulphur %	Sulphur lb	Phosphorus %	Phosphorus lb
Pig Iron, Low P	20	400	4.3	17.20	0.90	3.60	0.55	2.20	0.03	0.12	0.04	0.16
Pig Iron, Foundry	26	520	4.2	21.84	2.25	11.70	0.85	4.42	0.06	0.31	0.17	0.88
Silvery Piglets	4	80	2.5	2.00	7.50	6.00	0.65	0.64	0.05	0.04	0.10	0.08
Returns	30	600	3.30	19.80	1.40	8.40	0.60	3.60	0.10	0.60	0.13	0.78
Purchased Scrap												
Cast Iron Briquets												
Steel Briquets												
Steel Scrap	20	400	0.30	1.20	0.20	0.80	0.60	2.40	0.03	0.12	0.03	0.12
(Other) Mn Briquets								2.00				
Total	100	2000		62.04		30.50		15.26		1.19		2.02
Analysis Charged (Totals divided by Weight of Charge)			3.10		1.52		0.76		0.060		0.10	
Melting Loss or Gain			+0.30		−0.15		−0.15		+0.04		+0.03	
Estimated Analysis (Iron at Cupola Spout)			3.40		1.37		0.61		0.10		0.13	

Type and Amount of Coke per Charge __________

Type and Amount of Stone per Charge __________

Other, such as Special Fuels, Fluxes, etc. __________

Tom Makemson

Edward Longden

British Institute Holds 50th Anniversary Meeting

CELEBRATING its 50th anniversary, the institute of British Foundrymen held a special commemorative meeting in London on April 9, 1954, with its president, Edward Longden, in the chair.

Observing the founding of the Institute in 1904, the meeting also featured a lecture by two past-presidents of the organization, Vincent Faulkner and Samuel H. Russell: *"The Development of the Foundry Industry During the Past Fifty Years."*

A special competition was held among younger members of the Jubilee Celebration, involving the writing of papers on foundry developments. D. F. Bailey, Conventry, was the winner of the prize, which was presented at the banquet.

Also commemorative of the occasion, a 32-page, illustrated history of the Institute, written by the secretary, Tom Makemson, was published with the title: *The First Half Century.*

The Jubilee Banquet was held at the Cafe Royal, Regent St., London, on the evening of April 9, with Institute president Longden presiding. He read greetings from well-wishers throughout Britain and the world, including similar organizations in other countries. National President Collins L. Carter sent the official greetings of AFS. Other American foundrymen also joined in the tribute to I. B. F.

Principal speech at the banquet was made by A. R. W. Low, parliamentary secretary to the British Ministry of Supply, who spoke on the value of research and cooperation in promoting technical advancement within the industry. In his reply, president Longden reviewed some of the possible future developments, including new power sources and expanded applications of present sources.

A toast of related associations at home and abroad was proposed by John Bell, Glasgow, Scotland, senior vice-president of the Institute. He paid tribute to the men who had enough foresight 50 years ago to form the Institute, and to those who nurtured it through the years until it had assumed its place among the world's technical societies.

Respondent to Mr. Bell was Achille Brizon of Paris, president, International Committee of Foundry Technical Association, and past-president, French Foundry Technical Association. Mr. Brizon's speech was translated into English by Vincent Delport, European representative of American Foundrymen's Society, who offered personal congratulations to I. B. F. from its sister society.

F. W. E. Spies of Holland, president, Netherlands Foundry Association, and past-president of the International Committee, also responded, emphasizing the value of technical associations and research organizations in furthering our scientific progress. He referred particularly to the newly-established Foundry Research Institute in the Netherlands.

A toast was proposed by Noel P. Newman, past-president and honorary treasurer of I. B. F., to the Institute's secretary of 28 years, Tom Makemson, who has done so much to promote the Institute's ideals, and to encourage international cooperation among similar bodies.

In reply, Makemson modestly said that the progress of the Institute had been the work of a large number of people, and that his job had been to coordinate their efforts. He paid warm tribute to his colleagues and to all those who had helped him over the years in the discharge of his duties as secretary of I. B. F.

Among the other features of the evening were the presentation of a photograph of one of the early conventions by Samuel Russell; an illustrated address sent by the Norwegian Foundrymen's Association and presented by Vincent Faulkner; and a specially bound copy of the Institute history, presented by Dr. C. J. Dadswell, immediate past-president.

With its 5300 members, the Institute of British Foundrymen is one of the largest metallurgical societies in Europe. It was organized on April 9, 1904, when six foundrymen met in Birmingham and established the British Foundrymen's Association, a name changed to its present form 18 years later. Robert Buchanan of Birmingham was elected president and the convener of the meeting, F. W. Finch, became the first secretary and treasurer. The others present formed the Council, with power to add to their number.

Mr. Finch had conceived the idea of forming a British society after reading about the then 8-year-old American Foundrymen's Association (now AFS). Membership had grown to 50 in a few weeks and the first convention was held in Manchester in August, 1904.

At an early stage in its history, the idea of establishing branches was conceived, with the first formed in Lancashire in 1905. In 1937, the first overseas branch was activated in Johannesburg, South Africa. Latest addition to the list has been the 1953 organization of the Victoria branch of I. B. F. in Australia.

A movement began under the presidency of Thomas H. Firth, 1918-19, to incorporate by Royal Charter, which was granted by King George V in 1921.

Papers relating to technical and practical phases of foundry operation were presented at conventions from the beginning. Prof. Thomas Turner exercised a strong influence on the early technical program of I. B. F., and he was signally honored upon his retirement by presentation of a gold medal at the International Foundry Congress at London in 1929 by the Lord Mayor of London.

Williams Lecture Established

A development of major importance was the establishment of an annual lecture, the Edward Williams Lecture, named after an I. B. F. president, and first delivered in 1935 by Sir William Larke. It has been presented yearly since, except in 1938, 1940, and 1941.

The F. J. Cook Awards were established in 1946 by D. H. Wood, with prizes offered for suggestions on the improvement of foundry working conditions.

In keeping with the Institute's avowed purpose of promoting education within the foundry industry, it was decided to inaugurate a system of national examinations to make foundry instruction available on a national basis. These have become the City and Guilds of London Institute Examinations in patternmaking and foundry practice. This program has provided technical training for thousands of British craftsmen through the years.

The Buchanan Medal and Buchanan prizes were first offered in 1929 and are now awarded to final grade examination candidates. The P. H. Wilson Prizes have been awarded since 1948, based on results of intermediate examinations in both subjects.

Advanced training is also provided at the National Foundry College and a so-called "sandwich" course is offered at the Constantine Technical College, Middlesbrough. I. B. F. is represented on the governing bodies of both colleges. An annual foremen's course is sponsored each year at Ashorne Hill with the collaboration of the Joint Iron Council, covering management, administration, and applications of technical development of particular interest to foremen.

As the result of work by the first president, Robert Buchanan, I. B. F. was closely associated with the establishment of the British Cast Iron Research Association and has worked with that organization in promoting research in the metals industries.

Research was a continuing interest of the Institute and its members and in 1931 a Technical Committee was formed to coordinate such activities. Projects were carried out by subcommittees, one of which represented each branch of the metals castings industry. The Committee was completely reorganized in 1946 and became the Technical Council.

Exchange Paper System

AFS has enjoyed close relationship with I. B. F. since the latter's founding and one of the most noteworthy features is the system of annual exchange papers between the two societies, probably the oldest such reciprocal arrangement on an international basis in the world. It was based largely on suggestions by H. C. Estep and A. O. Backert, both of Penton Publishing Co., Cleveland. G. K. Elliott of AFA authored the first such paper, presented to the Blackpool conference of I. B. F. in 1921. In the following year, F. J. Cook personally gave the return paper at the Rochester (N. Y.) convention of AFA.

The first International Foundry Congress was held in Paris in 1923 and was attended by large delegations from Great Britain and the U. S. Americans en route were entertained in England. AFA organized the second International Congress, held in Detroit, 1926. At that meeting, AFA medals were presented to John Shaw and Prof. Turner of I. B. F. The first International Foundry Congress organized by the Institute was held in London in 1929. Samuel Johnson of AFA was then president of the International Committee of Foundry Technical Associations, which had been established at Brussels in 1926 to coordinate the relations between foundry societies in the various countries. Tom Makemson was appointed honorary secretary of this committee and has held this post ever since.

I. B. F. also sponsored the International Congress in 1939, and will host it again in 1955. The Institute was well represented at the 1952 AFS convention at Atlantic City, where H. Morrogh of the Institute was presented the Wm. H. McFadden Gold Medal. I. B. F. members had also joined in saluting the 50th Anniversary of AFS at its Cleveland Convention in 1946, when a large British delegation attended.

Exchange Author

H. W. Dietert

"D-Process for Precision Castings" is the title of the Official AFS Exchange Paper to be delivered by H. W. Dietert, Harry W. Dietert Co., Detroit, at the 51st annual Conference of I.B.F. at Glasgow, Scotland in June.

The Institute has annually presented gold medals and other awards to honor distinctive achievement in the industry. The Oliver Stubbs Gold Medal was the first, established in 1921 to honor a member for services to the Institute. The first award went to F. J. Cook in 1922.

The E. J. Fox Medal was founded by its namesake in 1936 and is awarded to acknowledge distinguished service to the industry by members or non-members, and not necessarily for services to the Institute. Prof. Thomas Turner won the first medal in 1937.

Barrington Hooper gave the funds to establish the British Foundry Medal and Prize in 1943, in collaboration with *Foundry Trade Journal.* The award is made annually for the paper judged to be the best presented during the year at any meeting of the Institute. The Medal and Prize may go to the same person, or to separate individuals.

Medals Given Since 1933

Meritorious Services Medals have been awarded since 1933, when F. W. Finch received it, marking outstanding administrative work, especially in the branches.

The *Foundry Trade Journal,* first published in 1902, lent its support to the formation of the Institute in the beginning, and became the official organ of I. B. F. in 1905, although still published by a separate staff. It is the medium for publication of papers and discussions. The Institute also publishes its own *Journal* in alternate months which is circulated among the membership to inform them of Institute activities only.

The current president of the Institute is Edward Longden, who received his practical foundry training at the British Westinghouse Co., now Metropolitan-Vickers Electrical Co. Ltd., Manchester. He received a technical education in metallurgy at Manchester College of Technology, and has at various times been patternshop and foundry manager at Tangyes, Ltd., Birmingham; John Hetherington & Sons, Ltd., Manchester; and Craven Bros., Ltd., Stockport. He was, most recently, works manager, David Brown-Jackson & Co., Ltd., Salford, from which position he resigned to practice as consulting foundry engineer.

Mr. Longden has been the recipient of many awards for achievement in the industry, and authored the official exchange paper to the AFS Convention at Philadelphia in 1948.

Tom Makemson, for 28 years secretary to the Institute, also began his career at the British Westinghouse Co., Manchester, where he was a patternmaker. He took technical foundry training at Manchester College of Technology, joined I. B. F. in 1917, and became its secretary in 1926. He is also secretary of the advisory committee on examinations in patternmaking and foundry practice of the City and Guilds of London Institute, and for many years has been a member of the Council of the British Cast Iron Research Association. Makemson has been honorary secretary of the International Committee of Foundry Technical Associations since 1926.

Attended 1952 Convention

He has worked diligently for years to help establish and maintain close technical cooperation and social relationship between I. B. F. and related societies in other countries. He is well known in the United States for his participation in AFS Conventions as an official I. B. F. delegate, and for his many other activities in connection with the International Foundry Congress and similar events. He last visited this country in 1952, when he attended the International Congress held at Atlantic City in conjunction with the 56th Annual AFS Convention and Exhibit of foundry equipment.

The Institute will hold its 51st annual Conference at Glasgow, Scotland, June 22-26, 1954. John Bell, honorary secretary of the Scottish Branch for 30 years and senior vice-president of I. B. F., will be elected to the presidency of the Institute.

The Lord Provost and Magistrates of the city of Glasgow will welcome members and their ladies at a reception and dance on June 22. The annual General Meeting and the technical sessions of the Institute will be held at the headquarters of the Institute of Engineers and Shipbuilders in Scotland. Most of the social functions will take place at the Grosvenor restaurant, except the annual banquet.

Official representative of AFS at the Conference will be H. W. Dietert, Harry W. Dietert Co., Detroit, a National Director of the American Society. He will present the official exchange paper from AFS: *"D- Process for Precision Castings."* Mr. Dietert also delivered the Charles Edgar Hoyt Annual Lecture at the 1954 Cleveland Convention of AFS, and has long been active in chapter and committee activities.

H. J. Heine . . . Technical Director

J. M. Eckert . . . Advertising Manager

H. F. Scobie . . . heads magazine

AFS Staff Changes Announced

THREE changes in the AFS headquarters staff have been made to consolidate AMERICAN FOUNDRYMAN operations and strengthen Society technical activities. Herbert F. Scobie has been named editor of AMERICAN FOUNDRYMAN in charge of both editorial and advertising operations. John M. Eckert is the magazine's new advertising manager, replacing Terry Koeller who has opened her own office (see Foundrymen in the News, page 28). Hans J. Heine, assistant technical director of AFS since July 1, 1953, has been appointed technical director.

Herbert F. Scobie, an editor of AMERICAN FOUNDRYMAN since February 1948, has been on the AFS staff since October 1945 when he started work for the Society on educational activities. His practical background of foundry operations and technology combine with his knowledge of AFS activities and acquaintanceships with industry personnel to provide a broad background for directing AMERICAN FOUNDRYMAN toward greater service to the castings industry.

A graduate of the University of Minnesota with a degree in chemistry and an advanced degree in metallography, Scobie has worked in industry and while teaching foundry practice at the University of Minnesota carried on a consulting practice. Before joining the AFS headquarters staff, he was active in Twin City Chapter operations and organized the first university student chapter of the Society.

John M. Eckert, advertising manager of AMERICAN FOUNDRYMAN, has held advertising managerial posts on several Ziff-Davis publications, including *Radio News, Photography, Radio and Appliances,* and *Radio Electronic Engineering,* during the past 13 years. His background in publications work and management of advertising sales is expected to help increase AMERICAN FOUNDRYMAN's value to the foundry equipment and supply field as well as to castings and patterns producers.

Prior to entering the field of advertising sales, Eckert was advertising manager of a photographic chemical manufacturer, a free-lance writer and photographer, traffic manager of a bus line, and secretary and engineer of a US-South American airline. This varied experience, plus architectural education at Carnegie Institute of Technology, are natural adjuncts to his post as advertising manager of the foundry industry's technical magazine.

Hans J. Heine, AFS technical director, was born and educated in Berlin, Germany. He holds a degree in mechanical engineering and an MS in metallurgical engineering from the Berlin Institute of Technology. Naturalized in 1942, he worked for Aluminum Co. of America from 1939-43, then enlisted as a private in the Army Corps of Engineers. Three years later, with Pacific theater service in both Engineers and Ordnance, he left the service as a captain to join Equitable Meter Div., Rockwell Mfg. Co., Pittsburgh, Pa. In 1948, he became chief metallurgist for all Rockwell plants east of Chicago, the position he held on joining the AFS staff as assistant technical director in 1953.

Correlation Committee to Meet

THE annual meeting of the AFS Technical Correlation Committee has been scheduled for June 9, 1954, in the Emerald Room of the Hotel Sherman, Chicago.

Chairman for the session will be W. W. Levi, Lynchburg (Va.) Foundry Co. He will be assisted by new AFS President Frank J. Dost, who will serve as Vice-Chairman of the Correlation Committee. Newly-elected Society Vice-President Bruce L. Simpson will also attend the meeting.

The chairman and vice-chairman of each of the technical divisions of the Society, and the chairmen of certain of the general interest committees have been invited to attend. Each chairman will present a 10-minute report on the past year's activities of his committee. These summaries give the various committee heads a comprehensive insight into the over-all technical program of the Society and enable an effective integration of the individual unit planning.

Following the luncheon period, plans for the technical program of the 1955 Convention will be discussed and a schedule of deadlines for technical papers will be adopted.

Also on the agenda for discussion will be the disposition of certain committees that have been inactive for extended periods. In addition, where the need for formation of a new committee is definitely indicated, the group will consider ways and means of its activation.

The annual meeting of the Technical Correlation Committee actually comprises a top-level planning session to implement the purpose of AFS to disseminate technical information throughout the industry.

Malleable Founders Study Sales Methods

Herbert E. Scobie / *Editor*

Malleable foundries must offer engineering service as well as castings to meet the challenge of today's buyer's market, according to George T. Boli, Northern Malleable Iron Co., St. Paul, Minn., president of the Malleable Founders' Society. Speaking at the opening of the MFS 5th Market Development Conference held at Carnegie Institute of Technology, Pittsburgh, Pa., April 8 and 9, Mr. Boli emphasized the need for new selling approaches as well as the importance of the foundry engineer participating in final designs to avoid costly design changes when parts are subsequently converted to castings.

Nearly 100 malleable founders and sales engineers attended the meeting which was carried on under the chairmanship of Thomas A. Scanlan, Eastern Malleable Iron Co., Newburgh, N. Y., chairman of the MFS Market Development Committee.

In setting the stage for the following speakers, Mr. Scanlan pointed out that selling is the life blood of business. Old fashioned buying is giving way to technical buying, he said, which can best be served by technical selling. Develop new markets, he advised, don't take jobs away from each other—a practice that creates no new business.

Visit Plans Outlined

Webster N. Jones, vice-president of Carnegie Institute, and J. W. Ludewig, associate professor, welcomed the conference to the institute and outlined plans for a visit to the school's metallurgical engineering department.

"What Have We Learned from Past Experience?" was the theme of a panel consisting of Lloyd Young, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., A. C. Sinnett, Terre Haute Malleable & Mfg. Corp., Terre Haute, Ind., and W. J. McNeill, Badger Malleable & Mfg. Co., South Milwaukee, Wis.

Everyone in the plant has to sell, not just the sales department, Mr. Young said, by producing the highest quality castings possible commensurate with reasonable production cost. Research is needed, he declared, in both new products and better production methods. He urged getting into product development and conversion selling, citing examples where savings to customers using malleable castings ranged as high as 50 per cent.

Mr. Sinnett reviewed the elements of inadequate cost systems which, though simple, were shown to give inaccurate results. Basic operations need to be broken down into cost centers within the departments, he stated, with costs relating to any center charged against castings only if their production actually involves that center.

Manufacturing advances were reviewed by Mr. McNeill who cited the change from hand-fired to powdered coal-fired air furnaces, duplexing, the trend from periodic to continuous anneal along with shortened annealing cycles, pearlitic malleable, and the trend toward use of synthetic sand. In referring to recently publicized precision casting processes, he said foundrymen could get more precise castings in green sand if they'd exercise the care and control required. He suggested that development of tests and sand testing equipment was a major advance in foundry practice because it enables foundrymen to duplicate sand properties.

Statistical Control Reduces Inspection

Tumbling barrels are giving way to airless blast equipment, the finishing department has better dies, and does more grinding, McNeill said. With statistical quality control, better inspection with less inspection is possible, he declared, adding that "we still get scrap for the same reasons we did 35 years ago." Today's malleable castings, he concluded, are sounder, stronger, and better. As a parting shot he suggested that salesmen emphasize to their customers the importance of good patterns.

Upturn in business about the middle of the year was predicted by George F. Sullivan, managing editor, *Iron Age,* who said that inventory correction is about over, auto sales and new building starts are increasing, and that personal income after taxes was $4 billion higher than last year. Percentage increase in castings shipments in recent years was three times the percentage increase in population, he said. On this basis, foundrymen can expect increased casting shipments in view of projected population growth, he added. Foundry equipment sales in January were best they'd been since August 1953, Sullivan said, indicating the foundry industry is definitely interestd in mechanization and automation.

Comparison of malleable castings with stampings and weldments was made by Clifford Lambert, Eberhard Mfg. Co. Div., Eastern Malleable Iron Co., Cleveland. Soundness of design and correct selection of material are two major considerations in the engineering of a metal part, he said. He indicated that foundrymen might well extend their sales policy to include complete engineering service, such as recommending another cast metal, or stamping, weldment, etc., where one of these would fit the particular application better.

Cast metals are free of directional properties, in contrast to wrought metals, Lambert said, at the same time warning that they're size sensitive and must be designed carefully for proper feeding and gating. Malleable iron is less sensitive to notch effects than most ferrous metals and is much easier to machine than other ferrous metals, he brought out.

A film on forgings was shown after which the group discussed the merits of malleable castings vs. non-cast parts. Malleable castings require less machining, need less draft than forgings, permit coring holes, make more intricate designs possible, are easier to machine, have no directional properties, have less weight and better finish, the group decided. The afternoon concluded with a showing of the MFS color-sound movie, *"This Moving World,"* and a discussion of possible changes in it.

Malleable Qualities Discussed

After dinner the conference continued with discussions at each table on the five most important qualities of malleable iron and five most important characteristics of a good salesman.

First speaker the second day of the conference was Mark M. Miller, National Malleable & Steel Castings Co., Cleveland, who discussed the growing use of pearlitic malleable iron. He cited the need for suitable pearlitic specifications and warned against going overboard in promoting pearlitic as had been done in the case of some materials and processes in recent years.

B. C. Yearley, National Malleable, led a discussion of pearlitic specifications, urging that the excessive number of overlapping specifications be minimized. He advised against complicated, impossible specifications with both chemical and mechanical requirements.

Technological developments reviewed by J. H. Lansing, MFS technical director, included shell molding, automatic molding, mold blowing, the D-process, pressure molding, and induction melting. He reported one shop was doing 10 per cent of its castings in shell molds, and that two malleable shops were known to have automatic molding installations. Progress reports on MFS projects on hardening and on gating and feeding were briefed.

Following a showing of Steel Founder's Society film on steel casting design, MFS President Boli spoke on malleable vs. steel castings. In most cases where malleable is interchangeable with steel, he said, malleable was not considered because design engineers are not sufficiently informed and malleable salesmen have failed to inform them.

Brazing of malleable castings to produce shapes impractical to cast was reported by J. Wesley Cable, consultant, New York. Silver brazing, he said, is successful because it does not destroy malleable properties, thereby requiring re-annealing. Joint cleanliness is extremely important, he stated, and ad-

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vised blasting with sand or pickling. Degreasing alone is not sufficient, and any operation that smears graphite can't be used. A joint is sufficiently clean when it won't soil a handkerchief rubbed across it, he said.

Mr. Cable pointed out that brazed joints develop their best strength in shear and are low in tension. Joints should overlap about five times the section thickness. A fillet of braze metal around the joint increases fatigue strength, he said. Heat slowly to keep the joint from going above 1325 F (brazing alloys melt at 1165-1250 F) and be sure all of the joint surface is at brazing temperature or the molten alloy will not wet and join the surfaces, he warned. Capillary action makes the molten alloy fill out the joint, he said, but a clearance of 0.0015-0.005 in. must exist at the brazing temperature. Practical service temperatures of silver brazed joints range up to about 500 F, Cable said.

Sales Require Attention

Speaking on *"Sales Tools and Their Uses,"* John Nabrezny, Michigan Malleable Iron Co., Detroit, said that they should get attention, hold attention, and sell the product. Visual aids such as MFS literature, company literature, slides, and the film *"This Moving World,"* he stated, require less concentration than listening. Those that can be left with the prospect are a reminder of the call after the salesman has gone. Keep up with personnel changes to insure that literature is being mailed to right people, he advised, and "sell" the literature, don't expect it to sell itself.

Samples should be similar to the customer's products, especially if they're not now made of malleable, Mr. Nabrezny said. Other effective selling tools include paper weights, novelties, small models of castings produced in the plant—all made of malleable—and a nicely coiled impact test wedge. Letters and phone calls can also be used to get sales messages across, the speaker said.

A three-man panel presented talks on sales management with Myron M. Ruby, Newark Malleable Iron Works, Newark, N. J., leading off on sales management. He described the operations of his company's sales department which he classified as (1) estimating, handling complaints, and handling samples, (2) sales promotion (advertising, direct mail, and top management visits to big users), and (3) reports and analysis (number of calls, cost of calls, and business developed). He cited the case of a 17 per cent response to a letter accompanied by a return post card. At bimonthly sales meetings, he said, the salesmen view films, hear talks by purchasing agents and foundrymen from other plants, and trade ideas with top management.

Lowell Ryan (standing, far left), managing director, Malleable Founders' Society, presents certificate to Frank Sabla, superintendent, Terre Haute Malleable & Mfg. Corp. (second from left, standing), signifying first place in group IV in the M.F.S. 1953 safety contest. Also shown: J. Wyrick, assistant superintendent (standing, third from left); L. A. Stergar, personnel manager, (next to Mr. Wyrick, standing); J. T. Sabla, vice-president (seated, middle row, far left); A. C. Sinnett, treasurer (at Mr. Sabla's left, seated); H. L. Arnold, board chairman (rear row, standing, second from right); F. R. Simmons, assistant treasurer (seated, front row, far right); and Mrs. B. J. Schobert, in charge of first aid.

Stewart C. Watson, Acme Steel & Malleable Iron Works, Buffalo, N. Y., presented the salesman's views. Customers expect salesmen to keep them abreast of engineering and product advances, to live up to the sales agreement, and to call as often after a sale as before, he said. The foundry expects the salesman to sell products produced in the normal course of business, and not get involved in jobs that can't logically be produced. The salesman is also expected to coordinate special features of a job with the production department, to look neat, and make clear, complete presentations to the customer.

The salesman, Mr. Watson said, should expect his company to produce quality castings, to meet special conditions agreed on, and to provide a reasonable selling arrangement, without all prospects being long-shots. In addition, he should expect to be provided with sales literature, an adequate expense arrangement, with authority to make adjustments and cost concessions, and with freedom to operate in a manner he feels is most effective.

Likened to Soldiers

Cal C. Chambers, Texas Foundries, Inc., Lufkin, Texas, likened salesmen to men on the firing line and said the rest of the organization was intended to serve them. It is the job of top management, he said, to coordinate the production and other activities of an organization to back up the salesmen. He confirmed the value of an occasional sales call by top management.

Guides to measuring markets were given by Joseph C. Profita, Methods Engineering Council, Pittsburgh, Pa. A measure of your market gives a knowledge of a total opportunity to make sales and indicates how good a sales job you're doing, he said. He broke down market measuring into a study of customers and prospects, geographic and industrial patterns, size and trend of the market, and finally the company's participation in the total market. In concluding, Profita stated that business history seldom repeats itself due to changing technological developments. Avoid mob psychology that makes you want to join in a rush to follow some trend, he warned.

We are new in a period that will separate the men from the boys, that will bring to the fore salesminded management, Frank B. Rackley, Jessop Steel Co., Washington, Pa., said at the last session of the conference. The key to 1954 business success lies in the sales department, he declared, adding that the United States has a sound foundation for a good economy. The country has been going through the greatest inventory adjustment that has ever occurred, he said. He pointed out that there was no fear of the future in competent places, and cited the announced plans of automotive companies and steel producers to invest heavily in expanding and modernizing.

Colonel Chambers presided at the dinner concluding the conference and introduced as first speaker MFS Managing Director Lowell D. Ryan. Industry may be too production minded and not sufficiently promotion minded, Mr. Ryan suggested. Selling and promotion are the keys to increased tonnage, he said, expressing the hope that the day of market research would come.

Final speaker was William Hazlett Upson, author of the Alexander Botts stories, whose subject was *"You Don't Have to Be Crazy, or What It Takes to Be a Salesman."* Requisites of a salesman, Mr. Upson said, include faith in his product and in himself, and recognition that he's part of a team. He should be tenacious, modest, an extrovert, cooperative, agreeable, and aggressive. Salesmen and the home office always view a problem in different ways, he said, and the salesman should be able to disagree with the home office when the occasion demands.

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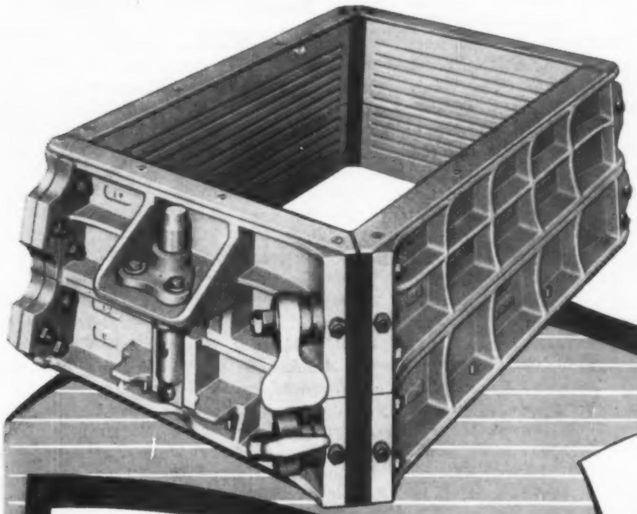

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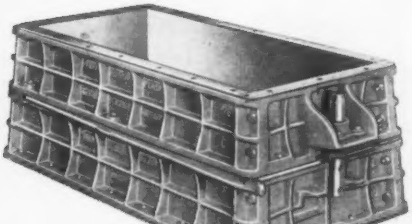

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Gray Iron Molding

Herbert J. Tidick
Metal Pattern

Announce Winners of AFS Apprentice Contest

THE thirty-first annual AFS Apprentice Contest set new records for the competition. An all-time high of 12 local chapters and 138 companies participated, with 352 entries, 108 of which reached the final judging at Cleveland Trade School on April 2.

The local chapters with sponsored entries were: Detroit, Eastern Canada, Metropolitan, Michiana, Northern Illinois-Southern Wisconsin, Northeastern Ohio, St. Louis, Northern California, Southern California, Twin City, Washington, and Wisconsin.

Northeastern Ohio scored heavily in the Contest, returning two firsts, one second, and two thirds in the final judging. Wisconsin followed with a first and two thirds.

An unusual feature of the 1954 Contest was the repeat preformances by two of last year's winners: Robert J. Luckenbill in steel molding, and William E. Morehead, gray iron molding.

First place winners in each of the five divisions received $100 and free transportation to the Cleveland Convention, where their prizes were presented by AFS President Collins L. Carter at the Annual Business Meeting. Second and third place winners received $50 and $25, respectively. Results of the national judging are listed below:

First Place Winners

Gray Iron Molding: William E. Morehead, Caterpillar Tractor Co., Peoria, Ill.; *Steel Molding:* Robert J. Luckenbill, Dodge Steel Co., Philadelphia; *Non-Ferrous Molding:* Donald Tetzlaff, Allis-Chalmers Mfg. Co., West Allis, Wis.; *Wood Pattern:* Steve Simon, Jr., Master Pattern Co., Cleveland; *Metal Pattern:* Herbert J. Tidick, Ford Motor Co., Cleveland.

Second Place Winners

Gray Iron Molding: George J. Ryan, Brown & Sharp Mfg. Co., Providence, R. I. *Steel Molding:* William Koenigshof, Clark Eqpt. Co., Buchanan, Mich.; *Non-Ferrous Molding:* Allen Bergadine, General Magnesium Foundries, Belleville, Ill.; *Wood Pattern:* Lewis Backus, Cleveland; *Metal Pattern:* William M. Piotrowski, City Pattern Foundry, Detroit.

Third Place Winners

Gray Iron Molding: Isaiah Doll, Hill Acme, Cleveland; *Steel Molding:* Richard F. Bernier, Bucyrus-Erie Co., South Milwaukee, Wis.; *Non-Ferrous Molding:* LeRoy Mocynski, Nordberg Mfg. Co., Milwaukee; *Wood Pattern:* John T. Farrington, Brown & Sharp Mfg. Co., Providence, R. I.; *Metal Pattern:* John Bolibrush, Motor Pattern Co., Cleveland.

The competition was open to all apprentices enrolled in a regular training course of not less than three years in length, and who were not over 24 on the day they prepared their entries. Veterans received special dispensation, being allowed an age limit of 24, plus the

Judges with final entries in wood and metal pattern divisions. Standing, background: F. C. Cech, Cleveland Trade School; J. E. Foster, AFS Headquarters, Chicago; R. W. Schroeder, University of Illinois, Navy Pier Branch, Chicago. First table, from left: F. J. Oklessen, Motor Patterns Co.; James Martin, Royal Pattern Works; J. F. Roth, Cleveland Standard Pattern Works. Second table: Ed Glosner, Modern Pattern Co.; C. A. Hartman, Cover Pattern Works, Inc.; Carl Tomasi, Denison Pattern Works; and W. F. Bock, Great Lakes Pattern Co.

Second Prize Winners

Lewis R. Backus
Wood Pattern

Allen C. Bergadine
Non-ferrous Molding

Wm. M. Piotrowski
Metal Pattern

George J. Ryan
Gray Iron Molding

Max W. Koenigshof
Steel Molding

Third Prize Winners

John S. Bolibrush
Metal Pattern

Isaiah Doll
Gray Iron Molding

John T. Farrington
Wood Pattern

LeRoy J. Moczynski
Non-ferrous Molding

Richard F. Bernier
Steel Molding

length of their term of service in the armed forces.

Members of the AFS Apprentice Contest Committee, which handled all details and judging, are: Chairman, R. W. Schroeder, University of Illinois, Navy Pier Branch, Chicago; Vice-Chairman, G. E. Garvey, City Pattern & Foundry Co., South Bend, Ind.; Secretary, J. E. Foster, American Foundrymen's Society, Chicago; F. W. Burgdorfer, Missouri Pattern Works, Inc., St. Louis; R. M. Lightcap, Rupp Pattern Co., Rockford, Ill.; E. J. McAfee, Puget Sound Naval Shipyard, Bremerton, Wash.; V. C. Reid, Jr., City Pattern Foundry & Machine Co., Detroit; G. Ewing Tait, Dominion Engineering Works, Ltd., Montreal, Canada; and J. J. Thompson, Fletcher Works, Inc., Philadelphia.

Master pattern for the molding divisions of the contest was made through the courtesy of National AFS Director G. Ewing Tait, manager of foundries, Dominion Engineering Works, Ltd., Montreal, Canada. Seventeen duplicate aluminum patterns were produced from the master by the plaster mold process at the plant of Scientific Cast Products Co., Chicago. Miscellaneous cleaning and finishing of the patterns was done at the facilities of the University of Illinois, Navy Pier Branch, Chicago, through the courtesy of R. W. Schroeder.

Drawings for contest projects were submitted by committee members and E. J. McAfee, Puget Sound Naval Shipyard, Bremerton, Wash., made a pattern from the wood pattern specifications to check for accuracy and to determine if the project could be handled by an apprentice in the time available.

The brass disks which were distributed to metal pattern contestants were ordered by G. E. Garvey, City Pattern & Foundry Co., South Bend, Ind., and paid for through the courtesy of Mr. Tait.

Eric Schwantes, International Harvester Co., McCormick Works, Chicago, arranged for the preparation of 15 boxes for shipping the molding patterns.

The AFS Apprentice Contest Committee is soliciting drawings of suggested projects for the 1955 Contest. Material should be shipped to J. E. Foster, Technical Assistant, American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

National judging of casting entries in 1954 AFS Apprentice Contest at Cleveland Trade School. Standing against window, G. T. Clifford, Fulton Foundry & Machine Co., Inc. Front table, from left: William Feth, Forest City Foundries Co.; and J. E. Foster, AFS Headquarters, Chicago. Second table: O. W. Street, Parker Street Castings Co.; Jack Kroecker, Mohawk Foundries, Inc.; Jerry Mercer, Mohawk Foundries, Inc.; and James Peters, Sterling Foundry. Third table: H. E. Hillstrom, Aluminum Co. of America; and R. C. Boehm, Wellman Bronze & Aluminum Co. Fourth table: Lester Schuman, National Malleable & Steel Castings Co.; T. D. West, West Steel Casting Co.; and R. W. Schroeder, University of Illinois, Navy Pier Branch, Chicago.

Foundry Tradenews

Clark Equipment Co., Buchanan, Mich., has established a **Ross Carrier Division** for its line of Ross straddle carriers, which will continue to be manufactured at Clark's Benton Harbor plant. In line with this development, Clark has now completed a 25-minute sound film: "Over-the-Load Materials Handling," shot on location at plants all over the country. The film depicts the basic design, operation, and application of the straddle carrier.

Lynchburg (Va.) Foundry Co. has moved its general office to the Courtland Building, 7th and Court Sts., Lynchburg, Va. All correspondence should be addressed to post office drawer 411.

New facilities are also announced by **Tempil Corp.,** which has moved to 132 W. 22nd St., New York, where offices, shipping, and plant are now consolidated.

Production has begun at the new **American Colloid Co.** White Springs (Miss.) plant. Southern bentonite is being mined and processed there, culminating an expansion program begun in 1948.

15/17 Christopher St., Finsbury Square, London, E. C. 2, is the new British address for **Denver Eqpt. Co.** The new quarters will be much enlarged and will provide better service for the company's customers in the sterling areas.

Gibney-Coffman Corp., Buffalo, N. Y., has changed its corporate name to **Gibney-Decot Corp.** Headquarters will remain at 2107 Kensington Ave. The firm represents several leading foundry, forging, and gear companies in western and central New York.

Herman Pneumatic Machine Co., Pittsburgh, Pa., has announced the appointment of **Hewitt-McGrail Co.** as its sales representative in Texas, Louisiana, and Arkansas. The organization will handle Herman's complete line of molding machinery, headquartering at 4215 Graustark St., Houston, Texas.

Denver Eqpt. Co. has moved its El Paso office to 207 W. 7th St., where A. B. Chavez continues in charge of the office and warehouse.

Sam Tour & Co., Inc., New York, has organized a new Titanium Analysis Section. Its operation will be based on extensive studies and thousands of laboratory trials in developing satisfactory methods for the chemical analysis of titanium metal and alloys, through nearly four years of research contracts with the U.S. Army Ordnance Corps.

Brinton Foundry, Inc., will henceforth function under separate management from the parent firm, **H. Brinton Co.,** Philadelphia. J. F. Deery has been elected president, having been general manager for 15 years. The foundry has been renovated and modernized within the past year. The reorganization was undertaken because the foundry is only 5 per cent captive, makes castings for many industrial customers.

Industrial and Foundry Supply Co., Inc., of California is the new corporate name of the **Industrial Foundry Supply Co.,** with offices at 1434 Howard St., San Francisco. In addition to the Howard street facilities, stocks will be maintained at the Oakland Warehouse Terminals, Oakland, Calif.

A. P. Green Fire Brick Co. of Texas, subsidiary of **A. P. Green Fire Brick Co.,** Mexico, Mo., has acquired the **Thermo Fire Brick Co.,** Sulphur Springs, Tex. Thermo has produced a complete line of fire-clay refractories, firebrick, dry press, stiff mud, and wood mold processes for over 30 years. The Texas Green Co. has headquarters in Houston.

Westinghouse Electric Corp. will break ground in May for construction of its new multi-million-dollar metals plant at Blairsville, Pa., and should be operating by mid-1955. Among other facilities, shell molding and investment casting will be installed.

American Cast Products, Inc., Orrville, Ohio, has completed a new four-page bulletin showing facilities for producing Amercast products in ductile iron, gray iron, alloy iron, and semi-steel. Pictured are the complete pattern shop, mold-making floor, modern materials handling and molding equipment, and specimens of representative castings. The booklet is available upon request from the firm.

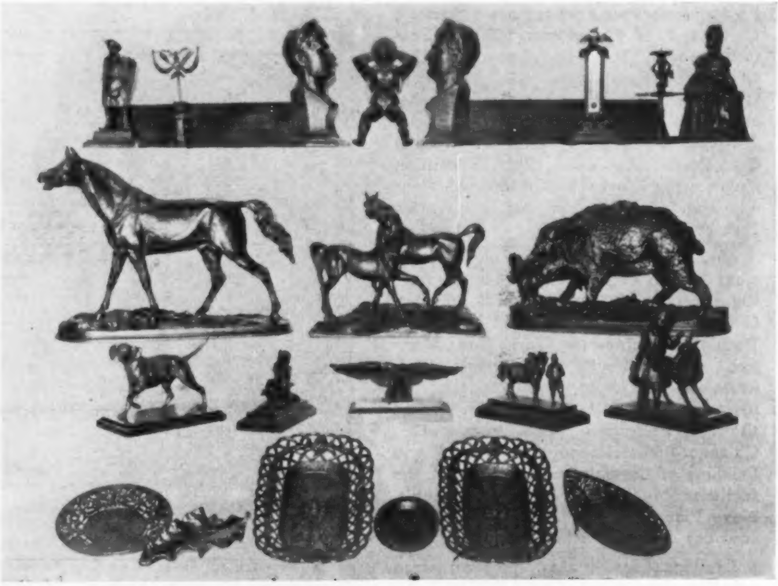
Crouse-Hinds Co., Syracuse, N. Y., has been building a new, modern non-ferrous foundry for basic metal work on the company's products. The new plant adds 55,600 sq ft of floor space to the Crouse-Hinds installation at Syracuse.

Announce Management Course at Iowa

The State University of Iowa, Iowa City, has announced its annual management course for June 14-26, inclusive. The university has printed an illustrated brochure which presents complete information and a full report on the 1953 course. Data are also provided for registration procedure. Inquire of J. Wayne Deegan, 122 Engineering Building, State University of Iowa, Iowa City, Iowa.

Hold Indian Symposium

At a symposium on "Non-Ferrous Metal Industry in India," organized under the auspices of the National Metallurgical Laboratory of the Council of Scientific and Industrial Research, F. C. Goldsmith, resident technical representative of Foundry Services (Overseas) Ltd., read a paper on "The Chemical Treatment of Molten Non-ferrous metals." The symposium was held at Jamshedpur, India, February 1-3.



This Lamprecht Collection of cast iron art, owned by American Cast Iron Pipe Co., Birmingham, Ala., is on display in the Birmingham Museum of Art. Originated by Prof. Gustav Lamprecht of Germany, it is the largest private collection of cast iron art in the world, with more than 1000 different pieces.

The National Castings Council held its annual election meeting at Cleveland during Convention week. Standing, from left: G. Dixon Shrum, FFMA; E. H. King, FFMA; F. Kermit Donaldson, SFSA; L. D. Ryan, MFS; D. H. Workman, GIFS; E. J. Walsh, FEF; W. B. Wallis, FEMA; Thomas Kaveny, Jr., FEF, and new NCC president; W. O. Larson, GIFS; A. J. Tuscany, Jr., FEMA; A. J. McDonald, SFSA; and D. V. Walker, MFS. Seated, from left: J. D. Wolfe, NFFS; R. L. Longsenkamp, NFFS; H. A. White, NFFS; J. T. MacKenzie, FEF, retiring NCC vice-president; F. G. Steinebach, FOUNDRY, NCC secretary; H. J. Trenkamp, GIFS, and retiring NCC president; F. J. Dost, new AFS president; H. A. Forsberg, SFSA; C. L. Carter, retiring AFS president; and W. S. Brunk, NFA. Two newly-elected officers of NCC not shown in photograph are: G. A. Baker, ACI, new vice-president; and F. Ray Fleig, re-elected treasurer. Breakfast meeting was held at Cleveland Athletic Club on May 12.

NCC-NFFS Elections

ANNUAL election meetings were held by National Castings Council and Non-Ferrous Founders' Society recently, with results announced during AFS Convention week at Cleveland.

National Castings Council

The National Castings Council is a top-level group composed of the president and one other representative from each of those organizations active in the metals casting field. Included are: Alloy Casting Institute, American Foundrymen's Society, Foundry Educational Foundation, Foundry Equipment Manufacturers Association, Foundry Facing Manufacturers Association, Gray Iron Founders' Society, Malleable Founders' Society, National Foundry Association, Non-Ferrous Founders' Society, and Steel Founders' Society of America.

In a breakfast meeting held at the Cleveland Athletic Club on Wednesday, May 12, the Council chose the following officers for the 1954-55 term: *President,* **Thomas Kaveny, Jr.,** Herman Pneumatic Machine Co., Pittsburgh, Pa., and president, FEF. *Vice-president,* **G. A. Baker,** Duriron Co., Dayton, Ohio, and president, ACI. *Treasurer,* **F. Ray Fleig,** Smith Facing & Supply Co., Cleveland, representing FFMA; and, *Secretary,* **F. G. Steinbach,** FOUNDRY Magazine, Cleveland. The latter two officers were re-elected to positions held during the 1953-54 term.

Non-Ferrous Founders' Society also elected officers at Cleveland. Shown at meeting, from left, standing: J. W. Wolfe, NFFS executive-secretary; past-president L. H. Durdin; and B. E. Weimer. Seated, from left: Retiring president R. L. Langsenkamp; new president H. A. White; new first vice-president W. L. Leopold; and new second vice-president E. J. Metzger. Meeting was held on May 9 in the Embassy Room of Cleveland's Carter Hotel.

Non-Ferrous Founders' Society

Four meetings were held during Convention week by Non-Ferrous Founders' Society, all at the Carter Hotel. A board of directors meeting was held on Saturday, May 8; a cost clinic on Sunday, May 9; the annual business meeting, at which elections were announced, on Sunday, May 9; and the annual reception and dinner on the evening of Monday, May 10, which feted retiring NFFS president R. L. Langsenkamp at a gathering attended by members and their ladies.

Officers elected for the 1954-55 term include the following: *President,* **H. A. White,** Smeeth-Harwood Co., Chicago. *First vice-president,* **W. L. Leopold,** Northern Bronze Co., Philadelphia. *Second vice-president,* **E. J. Metzger,** Multi-Cast Corp., Wauseon, Ohio.

J. W. Wolfe continues as executive-secretary of NFFS, which maintains administrative offices in Chicago.

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supplementing the display of machinery and equipment at the Public Auditorium.

AMERICAN FOUNDRYMAN reports below the technical sessions, round table luncheons, and shop courses held by the following AFS divisions and committees: Brass and Bronze, Light Metals, and Industrial Engineering. Meetings sponsored by other divisions and committees will be covered in a concluding report in the July issue of the magazine. All panel and discussion meetings will also be reported.

BRASS & BRONZE

THREE technical sessions, two shop courses, and a round table luncheon were scheduled by the Brass & Bronze Division, concentrated in the first two days of the Convention.

Presiding at the first session was H. J. Roast, engineering consultant, Ottawa, Canada. Vice-chairman was R. A. Colton, Federated Metals Div., American Smelting & Refining Co., Barber, N. J.; secretary, T. E. Gregory, Michigan Smelting & Refining Div., Bohn Aluminum Corp., Detroit.

Departure Often Permissible

Departure from recommended practice in gating is often permissible, C. L. Mack, Chautauqua Hardware Corp., Jamestown, N. Y., said in a paper titled: *"Gating Ornamental Yellow Brass Castings for Greater Production Economy."* Most of the work cited by Mack dealt with low-cost copper-base alloys, which ". . . seem to be losing popularity in the foundry today." Research is sadly needed in this field, he said, and a lower cost of yellow brass castings will return a variety of work to the sand foundry.

Former use of large gating systems and hard, fast pouring at high temperatures have caused misruns in thin castings, Mack declared. Improper location of gates often resulted in erosion and back pressure from mold gases. Enlarging runners to reduce flow velocity was also found to improve casting finish.

Mask recommended application of the principles of fluid mechanics and inertia in the development of gating systems. He found that raising the level of some parts of the gating system would modify the effect of inertia on metal flow. Pouring rate can be controlled by reducing the area from sprue to runner, and using a choke from tapered gates. A slow, continuous flow that allows mold gases to escape through the mold walls without venting will produce a low-cost casting with fine finish.

Second paper at the session, *"Some Experiences in the Shell Molding of Copper-Base Alloys,"* was presented by B. N. Ames, Doran Manganese Bronze Corp., Brooklyn, N. Y., for the authors: S. S. Brown, Shellmould Division, W. O. & B. Adams Pty. Ltd., Melbourne, Australia; and H. K. Worner, University of Melbourne.

Conserves Raw Materials

The authors indicated that shell molding has proved effective in Australia for the production of copper-base alloy castings, with added stress on the gating and feeding of shell castings. Although the process has only been used commercially there for two years, it is advantageous in conserving raw materials and minimizing machining operations. Cost savings accrue, also, they said, because of increased accuracy and consistency in production.

Brown and Worner emphasized the importance of correct ingating in shell molding because closer tolerances necessitate avoidance of all shrinkages which would interfere with dimensional accuracy. Like other semi-precision production techniques, they concluded, shell molding has its limitations also. While it will not alleviate all foundry troubles, it has much to offer for mass production of small and medium-sized components of copper-base alloys needing fine surface finish and accuracies to within 0.003 in. per in.

At the *"Research in Progress"* session, four speakers outlined recent activities expected to be reported in detail in the future. Fred L. Riddell, H. Kramer & Co., Chicago, presided. Vice-chairman of the session was A. W. Bardeen, Ohio Brass Co., Mansfield, Ohio, with D. G. Schmidt, H. Kramer & Co., as secretary.

W. H. Baer, Bureau of Ships, Navy Dept., Washington, D. C., briefed several projects out on contract to non-government agencies, including the revision of a foundry practice manual expected to be available in six months, a method of casting small, expendable propellors in shell molds, and use of a gating system featuring runner in the drag and in-gates in the cope for a slip ring runner.

R. H. Hanlon, Kennedy Valve Mfg. Co., Elmira, N. Y., outlined a laboratory test for measuring de-zincification of value stems, and pointed out the anomalous behavior of some waters which cause loss of zinc in brasses while others of apparently identical composition do not cause de-zincification

Discussing pressure molding of copper-base alloys, T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, described production of high-density molds using flowable sands and higher-than-normal squeeze pressures. It is necessary, he said, to put more energy into making a mold than the metal can put into tearing it apart.

C. M. Adams discussed recent studies at Massachusetts Institute of Technology to determine melt quality of bronzes. A perfectly-fed, wedge-shaped specimen was used to insure that porosity would be due only to gas. He described solidification of test specimens in a vacuum to accentuate the influence of gas on casting porosity. He suggested that copper may be able to dissolve a small amount of carbon which can subsequently react with oxygen to form carbon monoxide in the gaseous form.

"Application of Chills to Improving Pressure Tightness of Gun Metal (88-8-4)," by W. H. Johnson, H. F. Bishop, and W. S. Pellini, all of Naval Research Laboratory, Washington, D. C., was presented by Mr. Bishop at the third session. Chairman was H. L. Smith, Federated Metals Div., American Smelting

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The official AFS Ladies' Tea was held at the Hotel Cleveland on Monday, May 10.

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& Refining Co., Pittsburgh, Pa.; vice-chairman, R. J. Sahm, Jr., Lava Crucible-Refractories Co., Chicago; and secretary, H. C. Ahl, Jr., Down River Casting Co., Rockwood, Mich.

Open interdendritic paths or channels for movement of feed metal are necessary for complete soundness in a casting, the authors maintained. Casting geometry has no effect on mode of wall growth, but rather on the rate, resulting from differences in varying heat extraction rates at different casting positions. Directional solidification is achieved, they said, by a geometry providing solidification completion at the centerline or center plane in such sequence that the time of freezing is gradually increased in the direction of the riser. Strong directional solidification is required for metals which freeze in a mushy manner; progressive freezing metals may need only weak directional solidification.

Since feeding range is an important factor in maintenance of metal flow, the authors noted the effect of chills in increasing solidification rates in regions immediately adjacent. While chills will exert a potent influence on rate of solidification and degree of directional solidification, it is of relatively short range. They suggested use of chills in lateral rather than end positions for maximum effect, using a double taper or wedge design.

Pressure tightness, according to their investigations, requires strong directional solidification, which can be attained only through improvement in the quality of metal beyond that presently available, or the use of lateral type chills to overcome gas effects by increasing the degree of directional solidification.

R. B. Fischer, Ingersoll-Rand Co., Phillipsburg, N. J., presented a paper: *"Some Factors Affecting Metal Penetration of Navy 'M' Bronze Cores."* Time and cost of cleaning, and customer "eye appeal" are affected by metal penetration in cores, Fischer said. Coring is also important since the cavity is usually difficult to clean. The bronzes, particularly leaded-phosphor types, are probably greatest offenders in metal penetration. Two main types of penetration are veining, caused by core cracks; and "burnt-on," more of a mechanical mixture associated with metal-static pressure or head.

Amount of penetration, Fischer continued, is dependent largely on the permeability of the core sand. Zircon sand has properties productive of more penetration-resistant cores, because of high refractoriness, high heat conductivity, high density, and low expansion. A reputed chilling effect on metal by zircon could also retard penetration. The author reported the results of tests on the effect of additives on penetration. He also reviewed the function of core washes in controlling penetration, but concluded that resistance must be largely inherent in the sand mixture.

B. A. Miller, Crown Non-Ferrous Foundry, Inc., Chester, Pa., presided over the Brass and Bronze Round Table Luncheon, which has attended by more than 200 foundrymen. He was assisted by Vice-Chairman H. L. Smith, Federated Metals Div., American Smelting & Refining Co., Pittsburgh, Pa.

The meeting was opened with a series of reports by committee chairmen within the Division. It was indicated that the Research Committee will advertise the fracture test material in the industry, and will initiate projects on the relationship between melt quality, tensile properties, and macrostructure; and the effect of pressure tightness on melt quality.

When the discussion was opened to the floor, the use of synthetic sands in the non-ferrous industry received major attention. A problem in definition arose, with objection to the use of the term, "synthetic." It was felt that the word is misleading, and either "blended" or "controlled-compounded" were suggested as more descriptive and accurate terminology.

The C-process, according to one member of the audience, has done the most to encourage the use of synthetics, but they are more costly and require more control than do naturally-bonded sands. It was agreed on the floor that the natural sands of today are inferior in quality to those in use a quarter-century ago. One advantage of synthetics, it was maintained, is the need for less skilled labor in producing molds and cores.

Other questions that arose in the discussions concerned the economics involved in the casting of copper-base alloys with the C- and D-process, and the economics of high-pressure molding. Problems encountered in the melting and casting of high tensile aluminum and manganese bronzes, and silicon brasses, were also raised for discussion.

At the first Brass and Bronze Shop Course Monday M. G. Dietl, Schaible Co., Cincinnati, presided and vice-chairman was A. E. Jacobson, Jr., Grand Haven Brass Co., Grand Haven, Mich.

First paper was presented by R. W. Wendt, Industrial Pattern Works, Chicago, and covered *"Core Boxes and Driers."* C. H. Barnett, Foundry Equipment Co., Cleveland, was the second speaker and his subject was *"Core Ovens."*

Mr. Wendt pointed out that there is quite a variety of core boxes in use, both wood and metal. There is also quite a variety of designs and construction methods found in the boxes. Some have been constructed according to customers drawings and specifications but most of them are built and constructed as per the individual pattern shop experience, he said. In his shop, he pointed out, they have no set overall standards as to type of construction and wall sections. However, they build most of their boxes with boxed-in ribbing or sealtite ribbing, depending a lot on the shape and size of the core to be made. Driers, he said, like core boxes, can be made in many different ways and by many different methods, depending again on the service expected. How well a drier is to support the core is a decision that, in most cases, has to be made by the individual pattern supplier.

Mr. Barnett pointed out some of the difficulties encountered in old ovens. Satisfactory results, in many cases, depend on the skill and experience of the oven loader who is used to the quirks and idiosyncrasies of the oven. He cited improvements of the modern oven and described the operation of tower ovens. Dielectric ovens, he said, have several applications. Many are installed in non-ferrous foundries. Speed in the recycling of plate and drier equipment by use of dielectric ovens, afford savings, he pointed out.

At the second Brass and Bronze Shop Course held Tuesday, Mr. Dietl again

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Registration was brisk at the Public Auditorium all week.

Convention NEWS Story

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presided and Mr. Jacobson acted as vice-chairman.

G. E. Miller, Federal Foundry Supply Co., Cleveland, was the first speaker and his subject was *"Practical Know-How of Core Blowing and Machine Maintenance."* Uniform density, faster blowing and less physical fatigue, were some of the advantages he listed for blown cores as compared to hand rammed cores. By use of a poster showing a cutaway section of a core blower just after the core was blown, he described the mechanical operation of a core blowing machine. A second poster listed the eight operational steps necessary for the machine to complete its cycle. Maintenance mechanics, he said, should know how the core blowing machine is supposed to operate before attempting to service it.

Looking for Ideal Binder

"Oil, Resin, Cereal and Water Bonded Cores," was the subject of W. B. Bishop, Archer-Daniels-Midland Co., Cleveland, the second speaker. We are still looking for the ideal binder, he said. Stability and strength in the green stage, ease of shake-out and elimination of stickness, were some of the features we're still looking for. Cereal is good, he pointed out, but it is susceptible to picking up moisture again and is also susceptible to air-drying on the bench; good green strength and baked strength were two of the advantages he listed. Oil binders will not air-dry, but they don't bake as fast. Resins progressively cure and can't be kept in storage for a long period of time, but can be used in a dielectric oven.

LIGHT METALS

PROGRAM for the Light Metals Division consisted of four technical sessions and a round table luncheon. The first session was under the chairmanship of R. T. Wood, Aluminum Co. of America, Pittsburgh, Pa.; assisted by vice-chairman and secretary, W. Danks, Howard Foundry Co., Chicago.

First paper was presented by H. E. Elliott, Dow Chemical Co., Bay City, Mich., entitled, *"Gating and Risering of Magnesium Alloys."* He outlined cause and avoidance of defects during mold-filling and solidification. Gating or running will control mold-filling defects; solidification defects are controlled by good risering or feeding practice.

Avoidance of dross inclusions can be achieved, Elliott said, by controlling the filling rate near the beginning of the gating system, using the sprue as a choke. He described the use of screens and specially designed sprues and runner cups for this purpose. Gating conditions that lead to inclusion formation within the casting cavity were explored. These included cascading, air entrapment, and flow pattern.

Misruns resulting from incomplete filling of the cavity were described, with means of eliminating them. Uniformity of pouring rate, Elliott stated, can do more than pouring hotter and faster. Design considerations were also included.

Elliott presented a review of riser and feeding fundamentals for magnesium alloys. They are important in minimizing shrinkage during solidification, particularly in controlling the freezing process. Chilling practice was treated also.

Eutectic segregation of relatively high absorption coefficient were described as causing light areas on radiographs of EZ33 alloy castings in a paper co-authored by H. M. Skelly, Aluminum Laboratories, Ltd., Kingston, Ont., Canada; and D. C. Sunnucks, Aluminum Co. of Canada, Ltd., Montreal, Canada. In the paper, titled, *"Segregation in Magnesium-Rare Earths—Zinc-Zirconium Alloys."* Sunnucks reported of measures taken to eliminate the effect, and what properties it affected in the casting.

It was established by metallographic examination that the radiographically dense areas were simple concentrations of eutectic, or near-eutectic, composition. This phenomenon probably exists in some aluminum alloys, the authors said, although not normally observable. They described a laboratory technique for inducing segregation in test castings. It was determined, according to the paper, that creep strength, fatigue strength, and elevated temperature fatigue strength were not adversely affected by the segregation. Techniques commonly used to eliminate shrinkage, cracks, and other cavity-type defects were found effective in minimizing the intensity of the segregation.

Final paper at the session was *"Beryllium in Magnesium Die Casting Alloys,"* by F. L. Burkett, Dow Chemical Co., Midland, Mich. Supplementing recommended melting and handling practices, use of beryllium in minute quantities has significantly reduced melt losses in magnesium die castings. Burkett said that protection from oxidation may result from formation of a dense, elastic film of beryllium oxide with high surface tension at the melt surface of molten magnesium.

Burkett detailed methods of alloying beryllium to molten magnesium by suspending it just below the surface while the melt is stirred. More than a decade of experience, he reported, has revealed no casting difficulty arising from beryllium in magnesium alloys. Although some observers have indicated a coarsening of grain size in beryllium-alloyed magnesium, Burkett said it was not found in castings produced by the pressure die casting process. He also stated deleterious corrosion or toxicity effects do not result from its use.

The Monday afternoon session was presided over by D. L. La Velle, Federated Metals Div., American Smelting & Refining Co., South Plainfield, N. J. Vice-chairman and secretary was F. P. Strieter, Die Casting Div., Dow Chemical Co., Midland, Mich. Three papers were presented at this meeting.

Messrs. D. L. Colwell and Edward Trela, Apex Smelting Co., Cleveland, presented arguments favoring modification of #39 (SC84A, SAE-306), the standard aluminum die casting alloy, with a composition 3½ per cent copper, 9 per cent silicon. Their paper was titled *"New Aluminum Die Casting Alloys."*

Silicon content of 11 per cent has been favored since the war for improvement in casting, they said, particularly for thin wall castings requiring high fluidity. It is lower in cost and has higher yield strength than #13 (S12A). Because of

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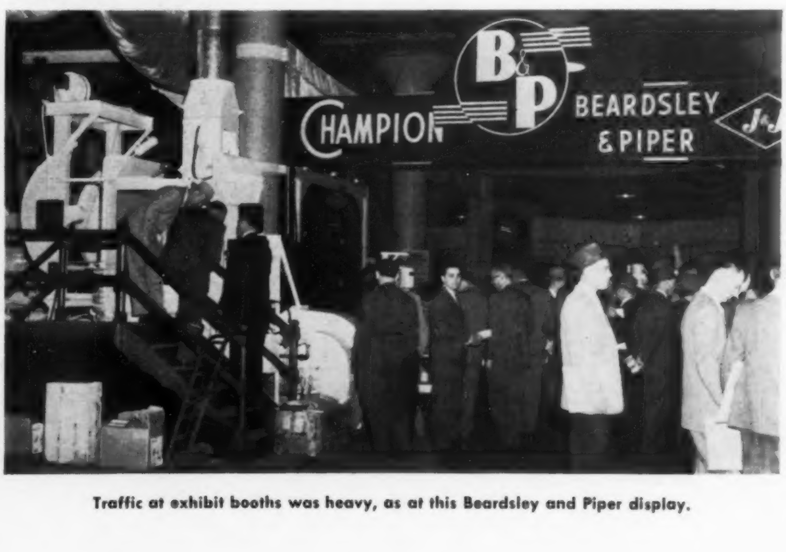

Traffic at exhibit booths was heavy, as at this Beardsley and Piper display.

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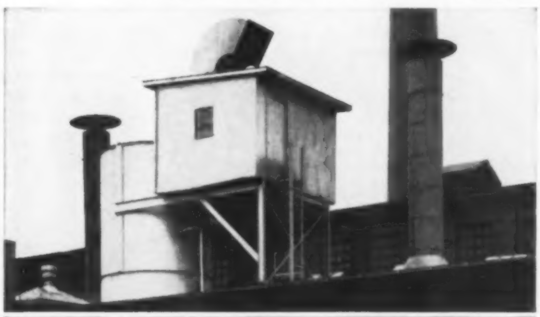
Small foundries—too,

BUY SCHNEIBLE EQUIPMENT FOR BETTER DUST CONTROL!



The smaller foundries — too, are users of Schneible Dust Control Equipment. Like the large production foundries, they have found Schneible has the experience and the equipment best suited for all foundry dust control.

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Convention **NEWS** *Story*

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recent trends toward use of aluminum-zinc alloys, the authors discussed results of tests, which indicate that zinc has no effect on corrosion resistance. Mechanical properties of alloys with each of the modifications were presented. Increased silicon, said Messrs. Colwell and Trela, gives some increase in yield strength and hardness, increased zinc has no apparent effect on mechanical properties.

C. O. Smith, Research Laboratories, Aluminum Co. of America, New Kensington, Pa., discussed *"Mechanical Properties of Aluminum Die Casting Alloys"* at the same meeting. Aluminum alloy die castings have been adapted to a variety of load-carrying applications, many requiring good fatigue resistance, Smith stated. He reviewed old and new data on typical static and dynamic properties of commercial aluminum die-casting alloys, considering nine, but stressing SC84 B, the best general purpose alloy.

Heating of 380 alloy at 212 F improves tensile properties, an aging behavior found to some degree in all aluminum die-casting alloys. Temperatures above 212 F showed no aging in 380 or any other die-casting alloy, he reported. Smith found little loss in fatigue strength when the as-cast surface on die castings was removed, contrary to general belief. Die castings, he concluded, may be used satisfactorily for stressed parts subjected to dynamic loading in service, and will, for many applications, weigh less per piece, require less machining, and perform as well as sand or permanent mold castings.

Marshall Holt, Research Laboratories, Aluminum Co. of America, New Kensington, Pa., interpreted the use of data obtained from fatigue tests on "metallurgical-type" specimens, as applied to aluminum alloy sand castings, in a paper: *"Some Factors Affecting Fatigue Strength of Aluminum Alloy Sand Castings."*

A series of tests determined, among other factors, that visual porosity grading does not give consistent grading of fatigue strengths, according to Holt. Sand holes, he said, and massive dross at an edge are harmful, whereas similar defects near the center do not seem to affect the strength of a casting adversely. Furthermore, his work would seem to indicate that discontinuities—gas porosity, sand holes, dross inclusions—ordinarily found in commercial aluminum alloy sand castings, have no significant effect on fatigue strength. The effect of repair-welding a casting will depend on size and location, but the fatigue strength of a casting with sand holes at an edge can be increased by filling the holes with weld metal.

R. F. Cramer, General Electric Co., Schenectady, N. Y., was chairman of the Tuesday morning Light Metals session. He was assisted by vice-chairman and secretary K. B. Bly, Fabricast Div., General Motors Corp., Bedford, Ind.

O. Z. Rylski, A. Couture, and J. W. Meier, Department of Mines & Technical Surveys, Ottawa, Ont., Canada, collaborated on the first paper, *"Effect of Centrifugal Force on the Structure and Mechanical Properties of Aluminum Casting Alloy C4."* They reported investigations into the varying range of mechanical properties found in centrifugal casting techniques. They sought to determine the true influence of centrifugal casting on structure and mechanical properties, as a result of turbulence and hydrostatic pressure during solidification.

Special melting equipment was designed for the tests, which sought progressive solidification of molten billets to decrease possibility of shrinkage cavities. X-ray examination indicated a characteristic zoned structure, with the lower peripheral zone consisting of fine-grained equiaxial crystals of lower density and lower copper content, but with less shrinkage and porosity than the upper zone. The upper zone, Couture reported, consisted of coarser equiaxial crystals, had higher hardness but lower mechanical properties. Mechanical properties of billets cast at higher speeds of rotation seemed to exceed those cast under the same conditions, but without rotation.

Although wrought aluminum represents the major share of engineering applications in aircraft structures, improving mechanical properties and soundness of aluminum castings would triple their use almost overnight, the session was told in a paper by W. D. Walther, C. M. Adams, and H. F. Taylor, all of Massachusetts Institute of Technology, Cambridge. Their paper, *"Techniques for Improving the Strength and Ductility of Aluminum Alloy Castings,"* described work by the foundry staff at M.I.T. to this end.

Studies of alloy solidification concerned the effects of dissolved hydrogen, solidification shrinkage, and unfavorable mechanism of freezing on size, shape, and distribution of microporosity in cast structures. Gas porosity is often designated as the principal cause of low mechanical properties of cast aluminum alloys, Walther stated. Small voids from entrapped gas are extremely damaging to mechanical properties. Liquid-solid shrinkage of interdendritic pools cause interdendritic voids, which gas will enlarge.

A high temperature gradient is the most important condition for reducing mushy zones during solidification, thus benefiting mechanical properties, and usually meaning a high freezing rate. Grain size, he maintained, will also markedly affect mechanical properties. A reduced size of grains, will increase strength and ductility even if the total gas content remains the same. This, despite the fact that hydrogen gas in solution in molten aluminum prior to pouring has profound effect on mechanical properties.

Thin sections in castings, Walther explained, exhibit higher mechanical properties than heavy section castings, due to higher thermal gradients during solidification. Thus, it may be more desirable to chill critical sections than to increase section size, in designing aluminum castings.

Concluding technical session for the Light Metals Division was held Tuesday afternoon, with O. W. Simmons, Rem-Cru Titanium, Inc., Midland, Pa., presiding; and P. D. Frost, Battelle Memorial Institute, Columbus, Ohio, acting as vice-chairman and secretary. Four papers were presented.

O. W. Simmons, Rem-Cru Titanium, Inc., Midland, Pa., and H. R. McCurdy and R. E. Edelman, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, described *"A Bottom-Pour, Arc-Type Furnace for Melting and Casting of Titanium."* To avoid the introduction of carbon, which results from use of an induction heater, and which reduces ductility and impact strength, and impairs weldability, the authors outline a method to introduce heat by an arc between an electrode and the titanium charge. A water-cooled copper container is used as a crucible, and castings are free of carbon contamination.

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At the Sand Shop Course Tuesday evening, from left to right: C. A. Sanders, American Colloid Co.; F. S. Brewster, Harry W. Dietert Co.; W. R. Jennings, John Deere Tractor Co.; J. W. Clarke, General Electric Co., Erie, Pa.; and L. E. Wile, Lynchburg Foundry Co.

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The authors described a tubular bottom-pour mechanism with detachable mold chamber. It could, they said, be constructed in shorter time than a comparable tilting type; was less prone to water leaks because of fewer soldered joints; had much more efficient water cooling; made possible more flexibility in gating and risering design; and had a pouring device much simpler and easier to operate. Other disadvantages, they claimed, outweigh the single benefit of a tilting-type furnace: that the amount of metal to be poured is not governed by the depth of metal that can be "pierced" by an arc of a given amperage.

R. E. Edelman and A. Tabak, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, authored the next paper, *"Mechanical Properties of Cast Titanium-Aluminum Alloys."* Aluminum, they said, meets all the conditions required for alloying titanium. It is castable, has good mechanical properties, is a non-strategic metal, and does not increase the density of the titanium. In addition, aluminum has high solubility in the alpha, room temperature, phase of titanium.

The authors found that ultimate tensile and yield strengths increased with greater amounts of aluminum in the alloy range. Hardness rose rapidly and linearly with additions of aluminum. Previous investigation had tended to indicate that 6-7 per cent aluminum is the maximum that will still maintain sufficient working ductility for the alloy. Since elongation at 6 per cent aluminum content is 10 per cent, further work is in progress to determine mechanical properties of alloys containing more than 6 per cent aluminum.

Four research metallurgists from Battelle Memorial Institute, Columbus, Ohio —R. M. Lang, J. Gissy, G. H. Schippereit, and J. G. Kura—collaborated on the next paper: *"Expendable Molds for Titanium Castings."* They reported on research to reduce mold reaction to titanium in refractory oxide shell molds by adding chemicals, and to develop expendable graphite shell molds with the same inertness to mold reaction as molds of machined graphite.

In general, they stipulated, castings from refractory oxide shell molds containing chemical inhibitors had better surface finish and less pinholing than castings made in molds of the same material coated with a graphite wash. Although all the molds tested contaminated the surface of titanium castings to some extent, it was shown that the contaminated layer can be removed without loss of detail or adversely affecting surface finish by pickling in 50 per cent sulphuric acid, containing 25 grams ammonium bifluoride per liter of solution.

Atmospheric elements can be eliminated from titanium melt by using an inert atmosphere of vacuum inside the melting chamber and mold, but contamination originating from the crucible presents a more difficult problem, said Marvin Glassenberg and M. J. Berger, Armour Research Foundation, Chicago, in a paper, *"Producing Titanium Alloy Castings."*

They described a furnace for studying casting characteristics of titanium, with graphite crucible because of the relatively slow rate of dissolving in titanium. The furnace melts up to 15 lb titanium at one time and carbon pick-up averages 0.7 per cent, they revealed. Melting and casting are performed in an argon atmosphere.

Zircon shell molds coated with a heavy layer of graphite wash were used in the tests, with only 2½ per cent phenolic resin as a binder to minimize gas pick-up. Runners and ingates, they explained, should be held to minimum length and bottom gating is almost mandatory. No abrupt direction changes should occur immediately beyond the point of entry. Metal should not be dropped into the cavity and the avoidance of sharp corners is important for sound castings.

The Light Metals round table luncheon was held on Monday at the Hotel Cleveland. W. E. Sicha, Aluminum Co. of America, Cleveland, presided; R. F. Thomson, General Motors Research Laboratories, Detroit, was vice-chairman.

J. G. Kura, Battelle Memorial Institute, Columbus, Ohio, presented a progress report for the Light Metals Research Committee: *"The Principles of Vertical Gating."* He used a 12-minute film to illustrate to the 215 foundrymen present the work being performed at Battelle under sponsorship of AFS and U. S. Army Ordance's Frankford Arsenal.

The high-speed film was shown at ⅛ of its recorded speed in order to demonstrate the results obtained in studying metal flow principles with water and transparent lucite molds. Experiments at Battelle have indicated, Kura said, that cross sections of sprues should be larger at the top than at the bottom, and that the runner should be enlarged at the base of the sprue to absorb some of the kinetic energy and help reduce jet effect in risers. The gate should enter the side of the riser, he continued, using the films to demonstrate his points. Turbulence and the jet effect can be further controlled by extending runners beyond the gate, with larger cross-sectional area.

Kura reported that the committee is studying runners, risers, and sprues in order to determine how far to go with the broad principles that have been thus far postulated. Within the next year, tests will be run with aluminum alloy castings, using these principles. A color, sound film is being planned for presentation at the 1955 AFS Convention.

"A Technique for Improving Quality of Investment Castings," was the title of a paper by D. G. McCullough, F. J. Webbere, and R. F. Thomson, General Motors Research Laboratories, Detroit. They reported a technique of pouring water in transparent molds for study of fluid flow to improve castings made by the investment process. The problem, they said, was encountered in the development of a cast super alloy for jet engine component applications; GMR-235.

Fluid flow studies were adopted to study gating systems for investment molds, following AFS-sponsored work at Battelle Memorial Institute. As a result of a series of fluid flow experiments, the authors stated, soundness of investment-cast test bars was greatly improved. Data from the studies enabled elimina-

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Monday morning at the Brass and Bronze Session seated from left to right: H. J. Roast, Consultant, Ottawa, Canada, and B. N. Ames, Doran Manganese Bronze Corp. Standing: R. A. Colton, Federated Metals Div., American Smelting & Refining Co.; T. E. Gregory, Michigan Smelting & Refining Div., Bohn Aluminum Corp.; and C. L. Mack, Chautaupua Hardware Corp.

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tion of turbulence and entrapment of air in gating systems. A dye was placed in the gating system to show flow patterns, providing a means of evaluating distribution of metal to risers to allow for shrinkage during solidification.

INDUSTRIAL ENGINEERING

TWO Industrial Engineering sessions were presented, both on Tuesday, May 11.

J. J. Farkas, Cincinnati Milling Machine Co., Cincinnati, presided at the morning session, assisted by vice-chairman and secretary Dean Van Order, Burnside Steel Foundry Co., Chicago.

H. W. Bielefeld, Ford Motor Co. of Canada, Ltd., Windsor, Ont., opened the meeting with a paper, *"Analysis of Work Content, Time, Distance and Speed at Conveyor Stations."* His presentation reported practical time study work designed to expedite operations in the Ford of Canada foundry. Bielefeld described the construction of time-distance charts, and their functions in space-time relationships. Such charts have proved helpful in resolving problems that cannot be answered from experience alone, he claimed. They can be used as bases for mathematical calculations if more accuracy is desired, for summarizing, and as work sheets in combination with standard data.

Graphical Aid Required

Time study work in the foundry requires every type of mathematical and graphical aid, Bielefeld maintained. Mechanization, the future trend, requires more thorough theoretical investigation before a practical application of a proposal or design is started, a precaution necessitated partly by the costliness of modern machinery installations.

E. W. Noakes, Lester B. Knight & Associates, Inc., Chicago, presented a paper prepared by John Taylor, Griffenhagen & Associates, Inc., Chicago, entitled, *"Educating Management to a Valuable Tool."* Time study and industrial engineering data, said Taylor, is seldom applied by management to the full extent of their potentiality. He advocated the use of standard data and job specification sheets on all foundry productive operations, where "the greatest losses occur today through the lack of proper information."

Since the use of specification sheets has come into general use only in the last 15 years, much indecision and wasted effort has resulted where jobs have had to be duplicated. Basic decisions have had to be made each time because of lack of proper records. Taylor also said that job sheets are useful in settling labor disputes, particularly over wage incentive prices. Specification sheets are also valuable in cost estimation, replacing old-fashioned observation or judgment methods.

Management training, he summarized, is essential to the complete use of standard data sheets. To that end, key personnel, supervisors, department heads, and shop foremen must be sold on the idea through a vigorous educational program by the industrial engineer.

The afternoon Industrial Engineering session also presented two technical papers. Presiding was C. J. Pruet, McWane Cast Iron Pipe Co., Birmingham, Ala. Vice-chairman and secretary: R. E. Evert, Eaton Mfg. Co., Foundry Division, Vassar, Mich.

The supervisor or foreman, as management's representative on the production line, can make or break the policies and commitments of the front office. Therefore, said E. D. Bolden, Westover Engineers, Milwaukee, a sound incentive plan should be instituted, based on extra pay for extra effort.

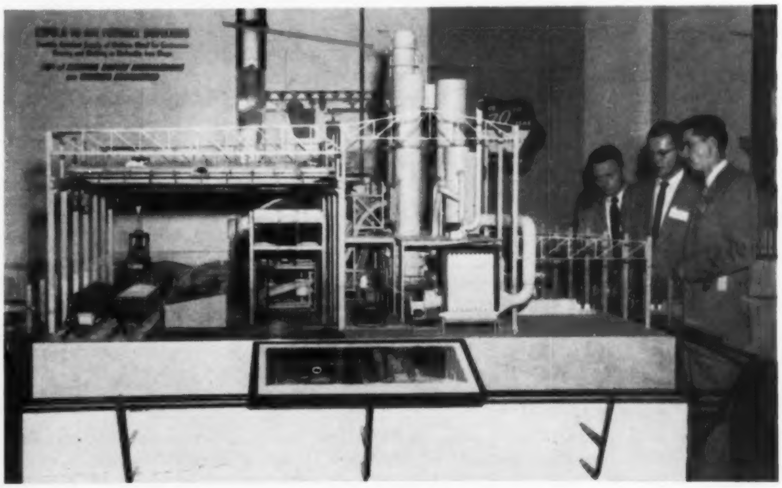
In a paper, *"An Incentive Plan for 'Line' Supervisors,"* Bolden outlined a multi-factor incentive plan to induce inter-departmental teamwork throughout the plant. The incentive pay, he said, should be approximately 25 per cent of the base, and should be paid by separate check at least once each cost month. Additionally, all supervisors should see a progress report of their own performance at least weekly, and the plan should be guaranteed for a stated period of time.

Continually rising costs in wages and materials make it necessary for every cost item to yield maximum output. A well-balanced incentive plan can coordinate numerous efforts involved at each level, and all levels may become integrated according to plan, thus developing a more complete cost control. Such a plan, emphasized Bolden, can also conserve higher operating supervision, make the most efficient use of staff services. The supervisor, he declared, is more likely to take fuller responsibility by taking the initiative of leadership. He virtually becomes a partner in the business.

Final paper was *"A Measured Daywork Program,"* authored by L. W. Lehmann, John Deere Van Brunt Co., Horicon, Wis. He recommended caution in introducing new equipment and new methods on daywork jobs, comparable with the care exercised on incentive jobs. Often, he said, day workers are given so-called merit increases without consideration for the individual's work load. A planned program of pay scales should take into consideration all the factors involved in the foundry operations, as they apply to each job.

Standards for all jobs is the solution, Lehmann predicted. He warned, too, against stopping with time study alone. For control, he said, only job standards should be used. He cited examples in his company and how daily work loads were established for floor-cleaning personnel, with considerable savings in work load and labor costs. When intelligent measurement is used, individual and departmental work load will be equalized, management profits from higher productivity factor, and complaints from labor are often significantly reduced.

AMERICAN FOUNDRYMAN will conclude its coverage of the Convention in the July issue. The following divisions and committees will be included: Sand, Gray Iron, Safety & Hygiene & Air Pollution, Refractories, Steel, Pattern, Malleable, Education, Plant and Plant Equipment, Plaster Mold Casting, Heat Transfer, and Foundry Cost.



Many displays featured scale models of foundry equipment.

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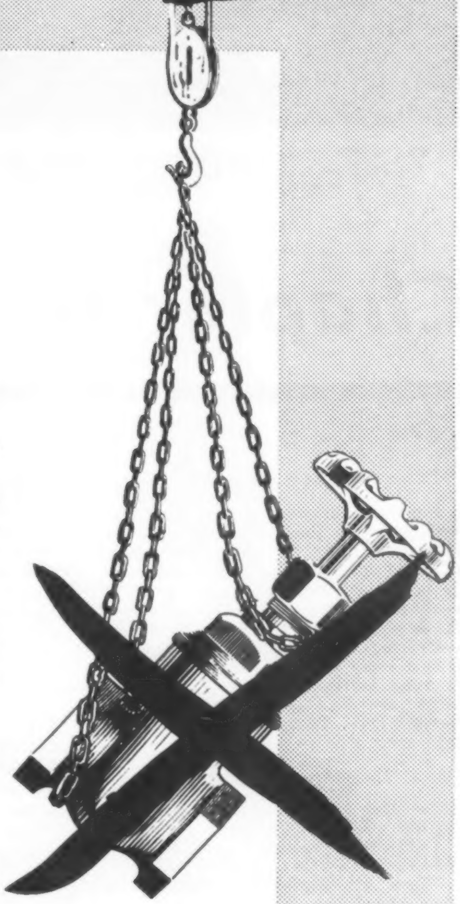

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The following are some of the causes of LOSING CASTINGS: 1. Permeability of molding sand is too low. 2. Strength of Molding Sand is too low. 3. Molding sand is too wet. 4. Gas holes from a core buckle. 5. Gas holes around cores. 6. Overheating and soaking metal. 7. A porous horizontal line which leaks. 8. Dirty ladles. 9. Dross inclusions embedded in side walls. 10. Cooling casting too rapidly. 11. Metal was poured too hot. 12. Using the swab too freely. 13. Improper furnace combustion. 14. Soft mold ramming. 15. Improper core making. 16. Steam holes from paste in cores. 17. Proper gate but riser ill-proportioned. 18. Undried ladles. 19. Holes from parting and mold cracks. 20. Watch your charcoal. 21. Improper gate. 22. Poor core mixtures. 23. No choke in sprue or runner. 24. Cold Metal.

While we have listed the most common causes for losing castings, the making of each particular casting must be considered as an individual problem.

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R. LAVIN & SONS INC 1900 54 Years 1954 SERVING THE FOUNDRY INDUSTRY

The men in this group were "Kings for the Night" at the February meeting of the Ontario Chapter, which honored foundrymen with 50 years or more in the foundry industry.

Chapter News

Going Down!

Total membership in the American Foundrymen's Society as of April 30, 1954 was 11,577. This is a decrease of 13 members over the previous month. In order to meet our goal of 12,000 members by June 30, 1954, a total of 423 new members are needed. Let's get behind our membership chairman and redouble our efforts to make the target by June. During April, eight new company members and one sustaining member have been added to the rolls. They are:

Company Members

***AiResearch Mfg. Co.*, Los Angeles, Calif.; Technical Library. (Southern California Chapter).**

***Albany Car Wheel Co.*, Menands, N. Y.; Peter E. Noonan, vice-president. (Eastern New York Chapter).**

***American Iron & Supply Co.*, Minneapolis, Minn.; Jack Vandenover. (Twin City Chapter).**

***Appalachian Hardwood Lumber Co.*, Cleveland; L. B. Lewis, Sales Mgr. (Northeastern Ohio Chapter).**

***Citizens Gas & Coke Utility*, Indianapolis, Ind.; Dean T. Burns, Gen. Mgr. (Central Indiana Chapter). Conversion from personal.**

***Nadler Fdy. & Machine Co., Inc.*, Plaquemine, La.; J. A. Nadler, Pres. (Texas Chapter).**

***Norean Pattern & Mfg. Co.*, Fruitport, Mich.; Herman H. Schreiber, Treas. (Western Michigan Chapter).**

***Wyotana Sales Co.*, Houston, Texas; R. E. Dansby, Partner. (Texas Chapter).**

Sustaining Members

***Raybestos-Manhattan, Inc.*, Passaic, N. J.; Lamar S. Hilton, Asst. Sales Mgr. (Metropolitan Chapter). Conversion from Company.**

Chicago

Mechanization with flexibility is necessary if today's foundry is to remain competitive, C. V. Nass, vice-president, Pettibone Mulliken Corp., and vice-president and general manager, Beardsley and Piper Div., told 140 members of Chicago Chapter at the May meeting. Speaking on *"Mechanization in Core Making,"* Nass accompanied his remarks with the showing of two films, one a short preview of a 3-D mechanized molding line documentary.

The advent of automation will institute a change in foundry thinking, he said, and we cannot afford not to keep pace. The highest mortality now is among those foundries with no mechanization at all. Rising costs of labor and materials can only be countered by increased productivity. Even a 15 per cent step up in production will enable a piece of equipment to pay for itself within a year, he claimed.

The chapter also conducted its annual business meeting and President John T. Rassenfoss, American Steel Foundries, East Chicago, Ind., read the annual report to the members. The chapter closes out its fiscal year with 817 members, just one more than the target set for 1954. Expenditures have slightly exceeded income, due principally to the establishment of the Robert E. Kennedy Scholarship fund at the Navy Pier Branch, University of Illinois, Chicago.

With the conclusion of the report, Rassenfoss called for nominations for officers and directors for the new year. None forthcoming, he declared the slate submitted by the nominating committee duly elected.

The new Chicago Chapter officers for the 1954-55 term are: *President*, Robert L. Doelman, Miller & Co., Chicago; *Vice-President*, James T. Moore, Wells Mfg. Co., Skokie, Ill.; *Secretary*, Daniel R. Jones, Illinois Clay Products Co., Chicago. New directors include: Harry C. Swanson, Arrow Pattern & Foundry Co., Inc.; Ford R. Snyder, Hickman-Williams Co.; and Sylvio C. Massari, Hansel-Elcock Co.

Western New York

Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, was featured speaker at the April meeting of the Western New York Chapter which assembled at the Hotel Sheraton, Buffalo, N. Y. In his talk on "High Pressure Molding," Mr. Barlow stated that green sand has always been available, but something new is being done about it. He noted that preliminary work in pressure molding was concerned with pressures as high as 600 psi which produced a waterless sand. However, equipment has been developed leading to a technique

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Michigan State College Student Chapter opened its annual membership campaign in March with a display and information booth in the college engineering building. Seated at membership campaign booth, Bruce Harding, left, student chapter chairman, and Jacob Goldberg, right, explain Chapter membership and activities to prospective member.

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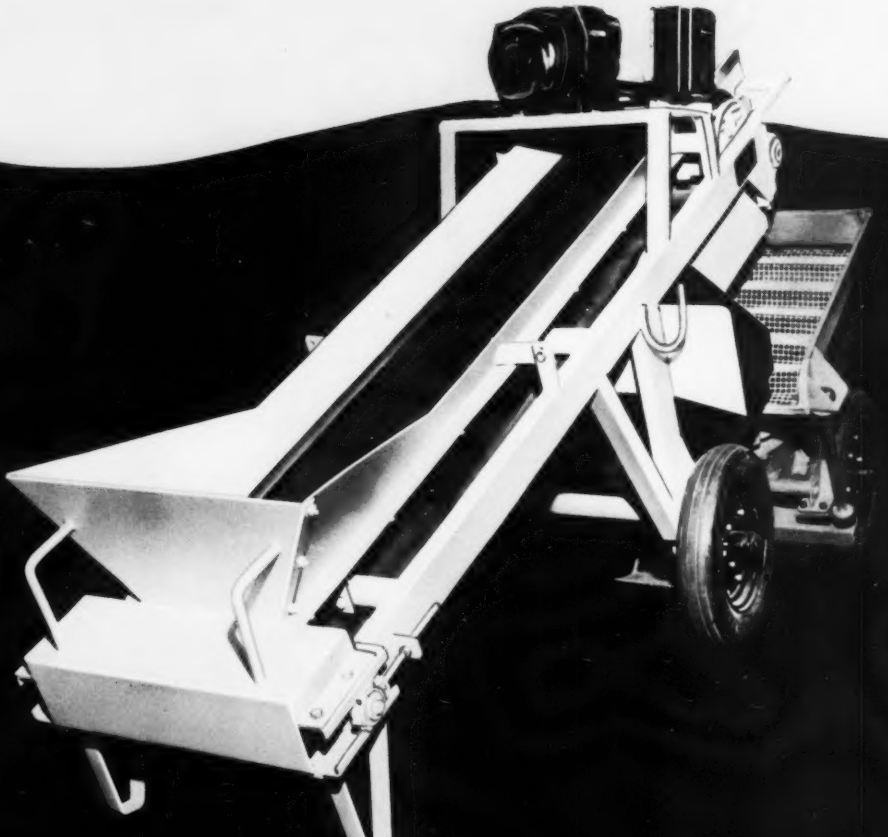

The Magnaveyor is a sturdy new belt loading unit with a dependable permanent magnet separator, built by Beardsley & Piper to meet a definite need for better foundry sand preparation.

The Magnaveyor loads a B&P Screenarator, or other conditioner, at a rate of up to 1500 pounds per minute, and completely separates iron scrap, shot, and wires and nails from the sand being loaded. It is highly portable and may be easily moved by one man from foundry floor to floor. It is easily and quickly placed in operation with a Screenarator, or other device, and appreciably increases the efficiency of the conditioning unit with which it works.

A small knee-high hopper for shovel-loading makes the Magnaveyor particularly convenient for side floor sand preparation. Once you try it your molders will never want to do without it. Write now for information. *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

MEMBER FEMA

Chapter News

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suitable for pressures as low as 80 psi. The idea behind this research, he pointed out, is to produce castings with the desired tolerances, and the elimination of swells.—*R. W. Walsh.*

St. Louis

A near capacity crowd attended the April meeting of the St. Louis Chapter to hear guest speaker Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, speak on "High Pressure Molding." Mr. Barlow defined pressure molding as green sand molding using fine, uniform sand, close pattern tolerances, and harder ramming. The result, he stated, is a casting with smoother finish, closer dimensional tolerances and absence of swells and strains. Mr. Barlow's address was followed by a question and answer period.

Chapter Chairman, Webb Kammerer, Pres., Midvale Mining & Mfg. Co., St. Louis, introduced several past-presidents of the Chapter that were present at the meeting.—*Jack Bodine.*

Saginaw Valley

A membership directory has been published by the Saginaw Valley Chapter for 1953-54, listing all officers, directors, committees, and members of the Chapter. For further information contact Chapter Secretary, Fred P. Strieter, 1211 Jerome St., Midland, Mich.

Groups of members attending the April meeting of the Chicago Chapter held at the Chicago Bar Association. Top, left to right, Roy Nelsen, Sterling Wheelbarrow Co., Arnold Grot, Edward Valves, Inc., C. V. Nass, Beardsley & Piper Co., John Owen, Harbison-Walker, John Rassenfoss, American Steel Foundries, S. C. Massari, Hansell Elcock, Robert Aeberly, Electro-Metallurgical Co., H. D. Krummel, Socony Vacuum Co., Harold Reckart, National Malleable & Steel Cstgs. Co. Bottom, left to right, Ted Haines, Woodruff & Edwards, Kenny P. Smith, Chicago Malleable Cstgs. Co., G. Skupa, International Harvester Co., E. E. Schwantes, International Harvester Co., Robert Dalton, Hills-McCanna Co., Joe Schallerer, Calumet Pattern Works, Robert Hendry, Love Bros., Inc.—*Photo courtesy Fred Ridenour, Whiting Corp.*

Washington

Election of Chapter officers opened the April meeting of the Washington Chapter at the Poodle Dog Cafe, Tacoma, Wash. The following members were selected to hold offices for the coming year: *Chairman,* James N. Wessel, Puget Sound Naval Shipyard; *Vice-Chairman and Membership,* Wm. A. Shaug, South Seattle Foundry; *Program Chairman,* Harold R. Wolfer, Puget Sound Naval Shipyard; *Secretary,* Fred R. Young, E. A. Wilcox Co.; *Treasurer,* Vernon W. Rowe, Ballard Pattern & Brass Foundry.

Featured speaker of the meeting, E. J. McAfee, Puget Sound Naval Shipyard, addressed the group on the subject "What's New in Patternmaking and Obligation of the Patternmaker to the Foundryman." Mr. McAfee stressed the point that the pattern is a tool for the foundryman and, therefore, should be made with every consideration for meeting the needs of the foundryman. He stated that the use of models on intricate casting jobs can save time and money in solving molding problems. To illustrate his talk, he displayed samples of several new woods available to the patternmaker.

Plastic patterns, he advised, have not been entirely satisfactory because they lack dimensional stability, but new experiments with epoxy casting resins show great promise and have proved to be dimensionally stable.

Leon Morel, Morel Foundry, Seattle, reported on the results of the recent apprentice molder and patternmaker contest, and led a discussion of plans for improving next year's contest.

Plans were outlined for the Chapter picnic outing to be held in August at Five-Mile Lake.—*Harold R. Wolfer*

At a special meeting of the University of Wisconsin Student Chapter in April, Foundry Educational Foundation scholarship holders received certificates. Left to right: J. Ewens, Grede Foundries; making presentation; Prof. Edwin Shorey, University of Wisconsin; Ray Tanner, Zenith Foundry Co.; Edward J. Walsh, Foundry Educational Foundation; and James Dance, University of Wisconsin student, receiving certificate.

Rochester

Highlight of the April meeting of the Rochester Chapter which assembled in the Ontario Room of the Seneca Hotel was an address by AFS Technical Director Hans J. Heine. Mr. Heine spoke on the topic "The Foundrymen's Most Unused Tool." Pointing out the present trend toward over-specialization in education and in industry, he emphasized the need for a broad, liberal educational system, and urged the cultivation of original, creative thinking.—*H. G. Stellwagen*

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Top, winners in the metal patternmaking and molding divisions of the St. Louis Chapter's apprenticeship contest. Bottom, winners in the wood patternmaking division.

Chapter News

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Central Michigan

Bob Hale, director of industrial training, Battle Creek Public Schools, Battle Creek, Mich., is organizing a foundry apprenticeship course approved by the U. S. Department of Labor's Bureau of Apprenticeship and the Michigan State Department of Vocational Education.

The program will be conducted each week, Monday through Friday, at the participating foundries, and Saturday mornings in Battle Creek. The Saturday sessions will last four hours each Saturday morning, or 168 hours a year for four years. The curriculum of the course will be based upon recommendations of the Educational Committee of the Central Michigan Chapter. A minimum of 10 students is required to start the course. To qualify for state aid, the apprentices must be under 21 years of age or war veterans.

For further information, contact A. C. Hensel, Educational Committee chairman, Central Michigan Chapter, Albion Malleable Iron Co., Albion, Mich., or R. S. Hale, Industrial Training Department, Battle Creek Public Schools, Battle Creek, Mich. Applications by letter will be accepted and should be sent to Mr. Hensel.—*Gardner R. Lloyd*

Michigan State College

Thirty-five members of the Michigan State College Student Chapter motored to Detroit March 12 for a tour of the foundry of the Cadillac Motor Car Div., General Motors Corp.

William C. Yaw, assistant foundry supervisor, greeted the group and acted as host at a dinner for the students in the company cafeteria.

Following the dinner, the young men were divided into small groups and guides were assigned for an extensive tour of Cadillac's foundry facilities.—*Thomas G. Thomas*

Western Michigan

Approximately 200 members and guests assembled at Bill Sterns, Muskegon Heights, Mich., for the April meeting of the Western Michigan Chapter.

Henry Laforet, Lakey Foundry Co., Muskegon, Mich., served as technical chairman for the meeting, and introduced the evening's speaker, William Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich. Mr. Farrell presented as his subject "D Process Molding." After his talk, he led a discussion period, and entertained the group with an account of his visits to foundries during a recent trip to Europe.—*Wilson W. Hicks*

University of Wisconsin

A special meeting of the Student Chapter of the University of Wisconsin, attended by approximately 35 students and faculty members, was held on April 8.

Through the work of Foundry Educational Foundation and the generosity of the Hewitt-Robins Co., the university was presented with a mechanical shakeout unit to be used in the metal casting laboratory. The presentation was made by H. A. Schuler, Hewitt-Robins Co. Dean K. F. Wendt, College of Engineering, accepted the gift. Following the presentation, Mr. Schuler addressed the group on "Materials Handling in the Foundry."

Foundry Educational Foundation scholarship students received certificates from J. Ewens, Grede Foundries, assisted by R. Tanner, Zenith Foundry Co., both representatives of the F.E.F. industry-advisory committee.

Concluding event of the meeting was an illustrated talk by E. J. Walsh and C. Esgar, Foundry Educational Foundation. Their talk reviewed the past achievements of F.E.F. and outlined plans for the future.

Officers for the coming year were elected at a recent meeting of the Student Chapter of the University of Wisconsin. The following members were named to hold offices: *President,* James Selle; *Vice-President,* Warren Ranscht; *Secretary-Treasurer,* Walter Krubsack. —*Richard W. Heine and Walter Krubsack*

Eastern New York

The annual joint meeting of the Eastern New York Chapter and American Society for Metals was held in April at Panetta's Restaurant, Menands, N. Y.

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William C. Yaw, Cadillac Motor Car Div., General Motors Corp., pointing out core assembly at the Cadillac Foundry to visiting members of the Michigan State College Student Chapter.

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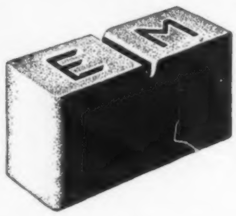

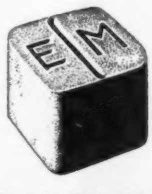

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George Begala, and George Rodrigues, right, first and second place winners, respectively, in the Metropolitan Chapter's apprentice contest.—*Photo courtesy John Bing, Metropolitan Refractories Corp.*

Chapter News

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Howard Taylor was guest speaker. Mr. Taylor chose risering and feeding of castings as his subject and presented data evolved from his Massachusetts Institute of Technology foundry research group. He began with a review of heat transfer conditions surrounding the solidification of castings and risers and emphasized the importance of radiation losses in materials poured at high temperatures.

The second half of his talk was devoted to an explanation of the use of exothermic mold materials and a demonstration of their potential in feeding applications.—*S. A. Eliot.*

Metropolitan

Tom Muff, Sorbo-Mat Process Engineers, St. Louis, was guest speaker at the April meeting of the Metropolitan Chapter, Newark, N. J. The subject of his talk was "Some Phases of Foundry Control."

Winners of the Metropolitan Chapter's apprentice contest were announced. George Begala, American Brake Shoe Co., Mahwah, N. J., was awarded first prize and George Rodrigues, Barnett Foundry, Irvington, N. J., received second prize.—*John Bing*

Texas

Three films on foundry practice were presented at the April meeting of the San Antonio Section of the Texas Chapter held at the Alamo Iron Works, San Antonio. Al Bernson, Linde Air Products Co., showed two of the films "Powder Cutting" and "Scarfing and Washing of Castings." The third film, "Safety in the Foundry Industry," was offered through the courtesy of Aetna Life Insurance Co.

Following the showing of the films, refreshments were served sponsored by the San Antonio Machine and Supply Co.—*Edward W. Pruske*

Toledo

Chapter officers and directors for the coming year were elected recently by

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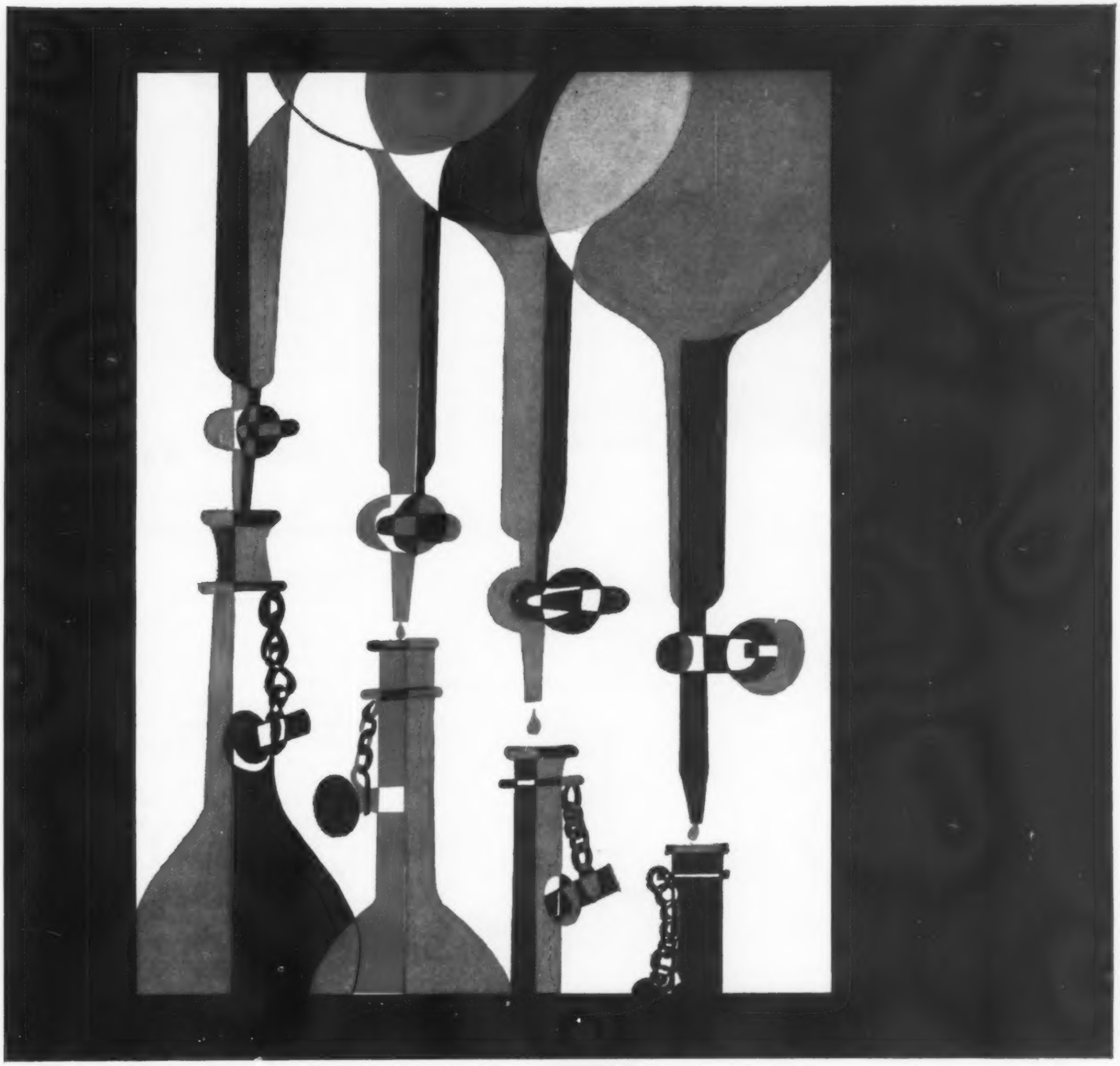

Fred Hodgson, secretary-treasurer, Michigan State College Student Chapter, right, assisted by Bruce Harding, Chapter chairman, left, presenting a leather "pocket secretary" as a parting gift to Ashley Sinnett, recently appointed AFS educational director. Mr. Sinnett was formerly foundry instructor, Michigan State College.

Chapter News

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the Toledo Chapter. The following members were chosen to hold offices: *Chairman,* C. E. Eggenschwiler, Bunting Brass & Bronze Co.; *Vice-Chairman,* Wayne Camp, Freeman Supply Co.; *Treasurer,* Harry Schwab, Bunting Brass & Bronze Co.; *Secretary,* R. C. Van Hellen, Unitcast Corp. *Directors,* (Terms expire 1957): B. J. Beierla, E. W. Bliss Co.; Carol Wandtke, Schill Pattern Works; R. E. Bossert, Maumee Malleable Casting Co. To fill unexpired term of Dr. M. F. Browne, Walter Barnhart, E. W. Bliss Co.—*R. C. Van Hellen.*

Philadelphia

The April meeting of the Philadelphia Chapter assembled at the Engineers' Club, Philadelphia. One hundred and twenty-five members and guests attended. Guest speaker of the evening was William H. Crawford, senior safety engineer, Liberty Mutual Insurance Co. His talk stressed the importance of the supervisor's role in making a success of a shop safety program.—*Charles R. Sweeny.*

Central Ohio

The Central Ohio Chapter held its April meeting at the Seneca Hotel, Columbus, Ohio. The meeting opened with an election of Chapter officers. Selected to serve as officers for the coming year were: *Chairman,* Ray Meyer, Ohio Steel Foundry Co.; *Vice-Chairman,* N. H. Keyser, Battelle Memorial Institute; *Secretary,* Karl G. Presser, Gray Iron Research Institute; *Treasurer,* Cyril Braun, Laclede Christy Clay Prod.; *Chapter Reporter,* Eldon Boner, Cooper-Bessemer Corp.

Guest speaker Dr. D. C. Williams, Ohio State University, Department of Industrial Engineering, addressed the group on "Another Look at Scabs." The scab discussed is one which has a "V" section and forms in conjunction with the defect known as a buckle. Dr. Williams pointed out that investigation to

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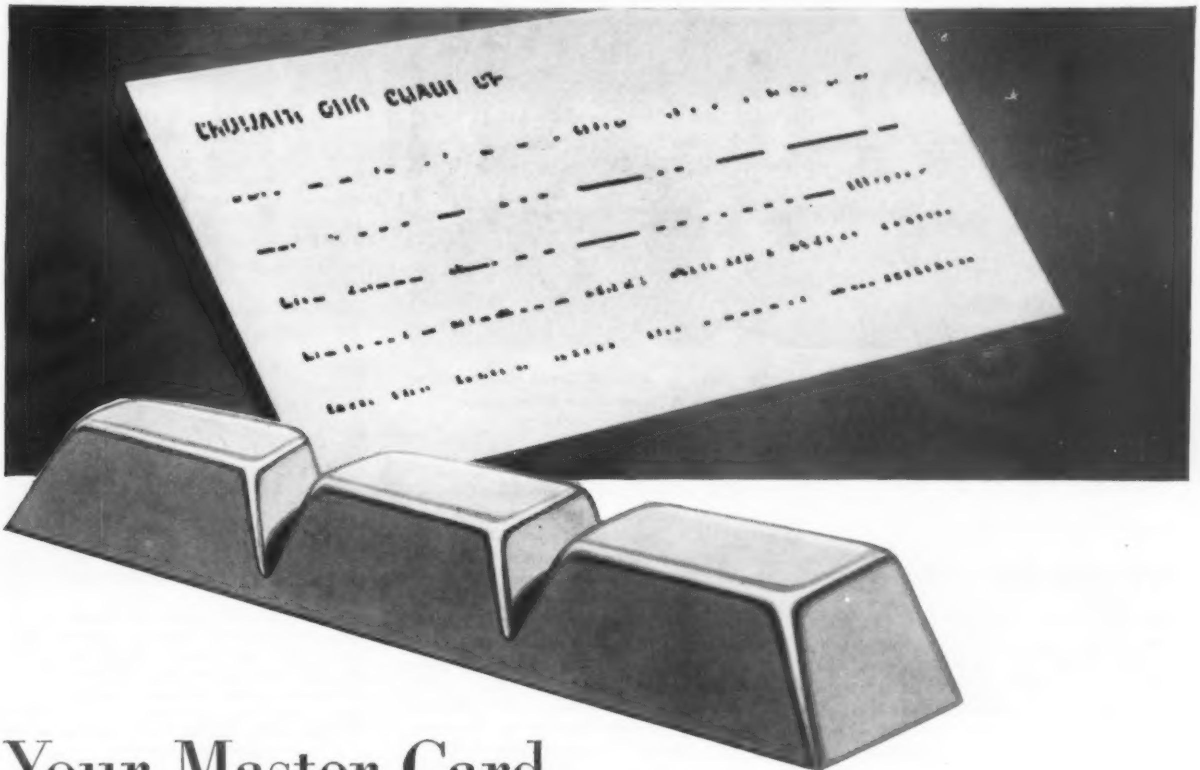

James A. Barrett, left, and William Ball, Jr., center, listen to Allen A. Evans during dinner at the Central Indiana Chapter February meeting, held in Indianapolis Athenaeum.

Chapter News

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date on these defects has centered around the expansion and construction of the sand. He observed that the chemical analysis of a scab is different from that of the parent metal. He also noted that these scabs form at a hot spot in the casting.—*Eldon Boner.*

Chesapeake

Clyde Jenni, chief metallurgist, General Steel Castings Co., was guest speaker at the March meeting of the Chesapeake Chapter held in the Engineers' Club, Baltimore, Md., Mr. Jenni spoke on the development of methods and inspection. In his talk, he covered design, visual inspection, the use of radiograph, gammagraph and magnaflux. He emphasized that engineering design, weight, strength ratio, machinability, weldability, and eye appeal are important in reducing the number of rejects. The talk was followed by a question and answer session.—*Henry M. Witmyer, Jr.*

Twin City

At the April meeting of the Twin City Chapter held at the Covered Wagon, Minneapolis, officers for the coming year were elected. *Chairman,* A. W. Johnson, Northern Malleable Iron Co.; *Vice Chairman,* H. H. Blosjo, Minneapolis Electric Steel Castings Co. Directors elected for three-year terms were: R. W.

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Left to right, AFS National Director A. D. Matheson, French & Hecht Div., Kelsey Hayes Wheel Co.; Earl White, retiring Corn Belt Chapter chairman; George Herman, Oehrle & Bergman; AFS National Director C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., at the April meeting of the Corn Belt Chapter.

Calendar of Future Meetings and Exhibits

June

3-5 . . Electric Metal Makers Guild, Inc.
Moraine-on-the-Lake, Highland Park, Ill. Annual Meeting.

7-18 . . The Iron and Steel Institute (London, Eng.)
Special Meeting in Sweden.

9-11 . . American Society for Quality Control
Hotel Jefferson, St. Louis. Annual Convention and Exhibit.

13-18 . . American Society for Testing Materials
Hotels Sherman and Morrison, Chicago. Annual Meeting.

14-15 . . Malleable Founders' Society
Seigniory Club, Quebec, Canada. Annual Meeting.

14-16 . . Management Course
College of Engineering, University of Iowa, Waterloo, Iowa.

22-26 . . The Institute of British Foundrymen
Glasgow, Scotland. 51st Annual Conference.

28-30 . . The American Society of Heating and Ventilating Engineers
New Ocean House, Swampscott, Mass. Semi-annual meeting.

July

13-15 . . Western Plant Maintenance Conference & Show
Pan Pacific Auditorium, Los Angeles.

August

9-14 . . Short Course: Cast Metals in Engineering Design—Fundamentals
Cast Metals Laboratory, University of Michigan, Ann Arbor, Mich.

16-20 . . Short Course: Cast Metals in Engineering Design—Application
Cast Metals Laboratory, University of Michigan, Ann Arbor, Mich.

September

13-25 . . First International Instrument Congress & Exposition
Philadelphia Convention Hall, Philadelphia, Pa.

19-26 . . Associazione Italiana di Metallurgia
Florence, Italy. 21st International Congress of Foundry Technical Associations.

27-28 . . Steel Founders' Society of America
The Greenbrier, White Sulphur Springs, W. Va. Fall Meeting.

October

6-8 . . National Foundry Association
La Salle Hotel, Chicago. 56th Annual Meeting.

14-15 . . Michigan Regional Foundry Conference
Ann Arbor, Mich.

14-16 . . Foundry Equipment Manufacturers' Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

15-16 . . Northwest Regional Foundry Conference
Vancouver, B. C., Can.

16-19 . . Conveyor Equipment and Manufacturers' Assn.
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

27-29 . . Grinding Wheel Institute & Abrasive Grain Association
Edgewater Beach Hotel, Chicago. Fall Meeting.

28-29 . . Metals Casting Conference
Purdue University, Lafayette, Ind. Sponsored by Central Indiana and Michiana Chapters of AFS and Purdue University.

28-30 . . Canadian Conference
Toronto, Ont., Can.

29-30 . . New England Foundrymen's Assn.
Massachusetts Institute of Technology, Cambridge, Mass.

AFS Calls for Nominating Committee Candidates

Local AFS Chapters not represented on the national Nominating Committee during the past two years are eligible to suggest candidates for the 1954 Committee. These eligible chapters should forward the names of two members for consideration, not later than July 1, as prescribed by Article X, Section 1 of the By-Laws: "The Board of Directors of each Chapter eligible to have a member on the Nominating Committee shall annually select two candidates for the Nominating Committee from the Chapter membership, preferably representing different branches or divisions of the industry with the membership."

Chairmen of eligible chapters who have not done so are urged to call board meetings to select Nominating Committee candidates, whose names should be sent to AFS, 616 So. Michigan Ave., Chicago 5, Ill.

Radiographs Published

A.S.T.M. Committee E-7 on non-destructive testing has published a booklet containing reference radiographs illustrating various types and degrees of discontinuities in aluminum and magnesium castings. They were selected from a large number of radiographs accumulated over a period of years.

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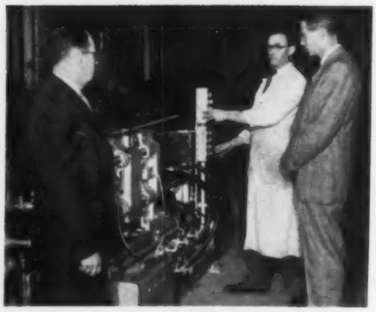


This die casting machine was donated to the foundry laboratory at Cornell University by Doehler-Jarvis Div., National Lead Co. From left, P. E. Kyle, School of Chemical and Metallurgical Engineering; D. J. Joyce, instructor-technician, foundry laboratory; and G. F. Hodgson, chief metallurgist, Doehler-Jarvis Division.

Snafu Safety Contest

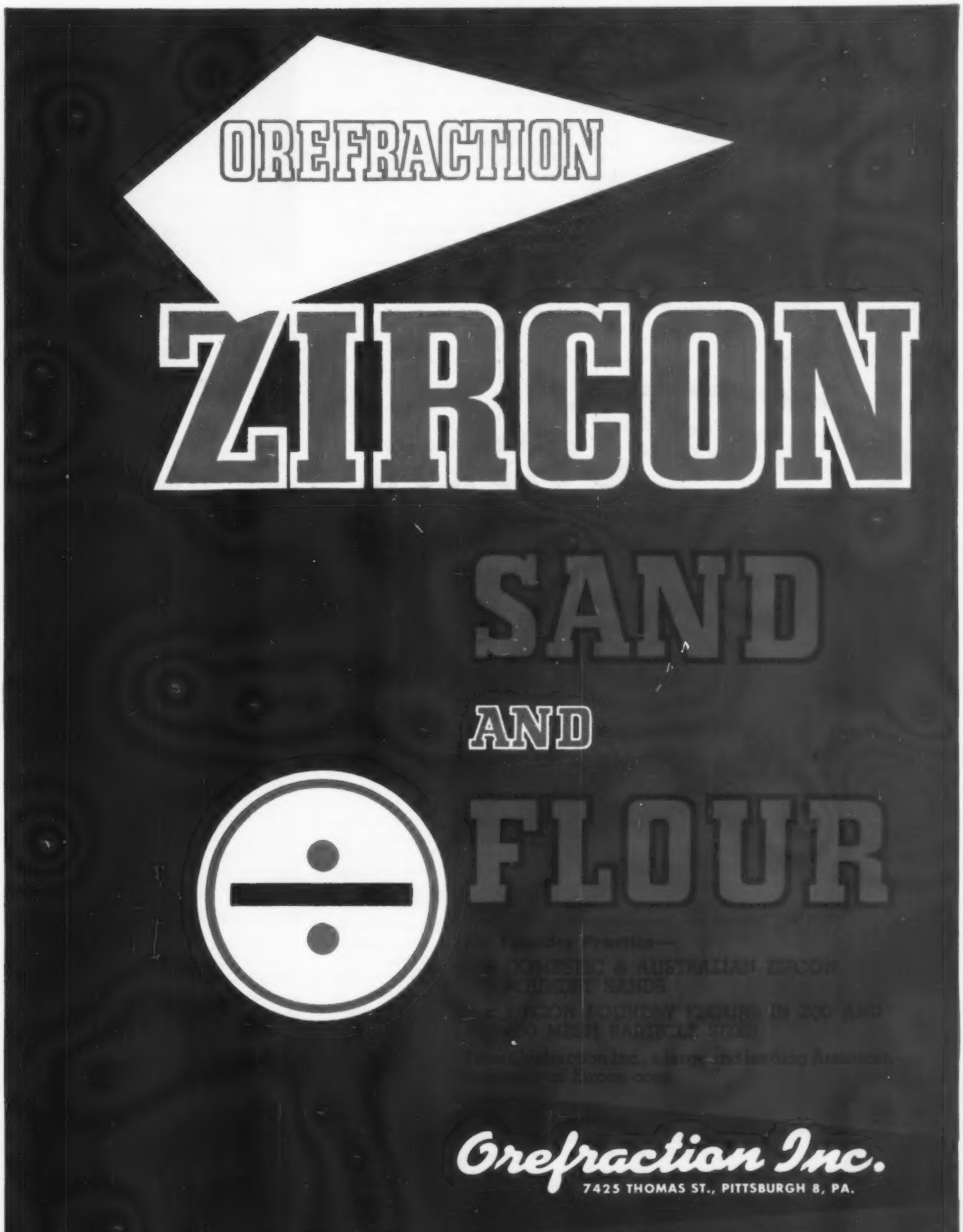
American Brake Shoe Co., through its magazine, *Brake Shoe News*, has been sponsoring a unique "Snafu Safety Contest." A two-page cartoon, showing a cut-away drawing of a foundry, and with workers violating every safety rule, was printed. All Brake Shoe employees were invited to enter the contest. Those listing the most specific safety hazards will win cash prizes: $50 first, $30 second, $20 third, and seven prizes of $5 each.

Caterpillar Donates Shake-out to Illinois

Caterpillar Tractor Co., Peoria, Ill., recently donated a two and one-half ton shake-out to the Department of Mechanical Engineering of the University of Illinois. The presentation was made in cooperation with the Central Illinois Chapter of AFS, according to F. W. Shipley, foundry manager at Caterpillar.

The shake-out measures four by five feet, and vibrates 900 times per minute. It was purchased by Caterpillar in 1941 and completely overhauled last year. The company also gave a sand blender to the university in 1952.

This impeller was made for pump used in emergency service for extraction of magnesium and other chemicals from sea water. Frank Mazor, Bayonne (N. J.) Foundry, holds small sand-cast impeller for comparison with large 3000-lb. impeller in foreground.



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Chapter News

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Ovestrud, Minneapolis Moline Co.; Edward Sitarz, Prospect Foundry Co.; J. J. Uppgren, Northern Ordnance, Inc.

Carl W. Sundberg, research assistant, Minneapolis Electric Steel Castings Co., presented a paper on "Better Casting Finish Through Tighter Sand Control." His paper was directed toward the practicing foundryman and dealt with workable production techniques.

It was announced that R. C. Wood, president, Minneapolis Electric Steel Castings Co., has been appointed to the board of trustees of the Foundry Educational Foundation.

R. W. Wilson, metallurgist and assistant foundry superintendent, American Hoist & Derrick Co., St. Paul, will be leaving the Twin City Chapter for a position with the Electro Metallurgical Co., Chicago.—*R. J. Mulligan.*

Corn Belt

At the April meeting of the Corn Belt Chapter, new officers for 1954-55 were elected. Chosen to hold offices were: *Chairman,* George Herman, Oehrle & Bergman; *Vice-Chairman,* Vernon Holmes, Paxton-Mitchell Co.; *Secretary-Treasurer,* Jack Henderson, Omaha Steel Works.

Two AFS National Directors, A. D. Matheson, French & Hecht Div., Kelsey Hayes Wheel Co., Davenport, Iowa, and C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, were guests for the evening. Mr. Nass conducted a meeting on mechanization of core rooms.—*Ira Trachtenberg.*

Acting Technical Chairman, P. H. Flynn, International Nickel Co., Bayonne Works, left, and guest speaker, Tom Muff, Sorbo-Mat Process Engineers, St. Louis, right, at the April meeting of the Metropolitan Chapter. —*Photo courtesy John Bing, Metropolitan Refractories Corp.*

Wisconsin

The general and sectional meetings of the Wisconsin Chapter were held in April at the Schroeder Hotel, Milwaukee. Preceding the meetings, dinner was served to the attending members and guests.

D. L. Day, Badger Fire Brick Co., Milwaukee, speaker at the non-ferrous session, presented a film entitled, "Master of Fire Servant of Industry," explaining the manufacture of fire bricks. —*Walter R. Matschulat.*

Northwestern Pennsylvania

A dinner honoring Northwestern Pennsylvania Chapter Chairman, Charles F. Gottschalk, was held in the Blue Room of the Erie Moose Club, Erie, Pa., preceding the March meeting of the Chapter.

Following the dinner, Bailey Herrington, program chairman, introduced guest speaker Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago. Mr. Barlow spoke on "High Pressure Molding." Tracing the history of molding techniques from antiquity to the present time, he stressed the fact that few changes had been initiated until the last few years when the "C" process and the "D" process and most recently the "High Pressure Process" were introduced. The "High Pressure Process," he stated, can be adapted in most foundries at a nominal cost.

Chapter Secretary, Jacob Diemert, Erie Castings Co., announced at a noon meeting of the board of directors that

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AFS Technical Director Hans J. Heine, featured speaker at the Rochester Chapter's April meeting in the Ontario Room of the Seneca Hotel, Rochester, N. Y.

Chapter News

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Earl Strick, Chapter educational committee chairman, had notified him that the Northeastern Ohio Chapter had purchased a copy of the AFS film "A Career in Metals" and presented it to the Cleveland Trade School.—*Roy A. Loder.*

Detroit

A program on "Molding Methods" was featured at the April meeting of the Detroit Chapter held at the Detroit Leland Hotel, Detroit. Moderated by C. W. Hockman, Cadillac Motor Car Div., the program was presented in the form of a panel discussion. Four principal speakers addressed the group on the following subjects: "The 'C' Process," H. G. Sieggreen, Central Foundry Div., General Motors Corp.; "The 'D' Process," O. Jay Myers, Archer-Daniels-Midland Co.; "Pressure Molding," T. E. Barlow, International Minerals & Chemical Corp.; "Green Sand Molding," E. E. Woodliff, Foundry Sand Service & Engineering Co. Mr. Sieggreen supplemented his talk with a sound-color film and slides showing operations at Central Foundry Div., General Motors Corp. After the panel discussion, Mr. Hockman conducted a question and answer period. —*R. Grant Whitehead.*

Other Organizations

American Society for Metals

Acting on a resolution by the committee-at-large at the February meeting, the executive committee of American Society for Metals voted that the annual educational series lectures shall be known as the Marcus Aurelius Grossman Memorial Educational Lecture Series. It was recommended that topics pertaining to Dr. Grossman's work be selected. Since his interests spanned the entire field of metallurgy, there will be little actual limitation as to subject matter for the lectures.

Alloy Casting Institute Reprints Resistance Paper

Alloy Casting Institute has made available reprints of a paper, "Resistance of Cast Fe-Cr-Ni Alloys to Oxidizing and Reducing Flue-Gas Atmospheres," by J. H. Jackson, C. J. Slunder, O. E. Harder, and J. T. Gow. The seven-page paper is reprinted from the *Transactions* of A.S.M.E. It directs attention toward the influence of sulphur content on corrosive attack by hot gases and comprises a complete report of the comprehensive series of tests made at Batelle Memorial Institute under the sponsorship of A.C.I. Address the Institute at Mineola, N. Y.

Aluminum Association Elects Officers

The Aluminum Association elected officers at its three-day annual meeting in January. D. A. Rhoades, Kaiser Aluminum & Chemical Corp., Oakland, Calif., was re-elected president for the year. Arthur V. Davis, Aluminum Co. of America, New York, was re-elected board chairman; and D. M. White was reappointed secretary and treasurer. Several vice-presidents were re-elected: S. D. Den Uyl, Bohn Aluminum & Brass Corp., Detroit; Raymond Deutsch, Monarch Aluminum Mfg. Co., Cleveland; and R. P. Stranahan, Stranahan Foil Co., Inc., South Hackensack, N. J.

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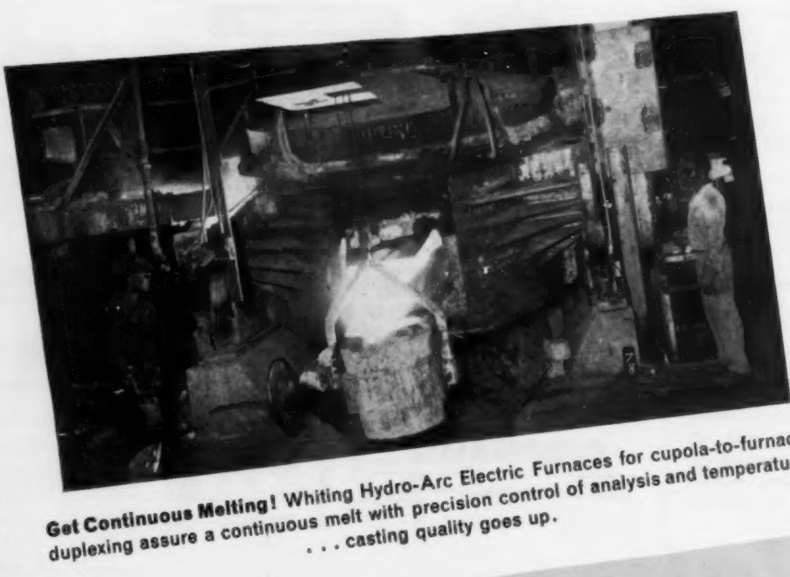

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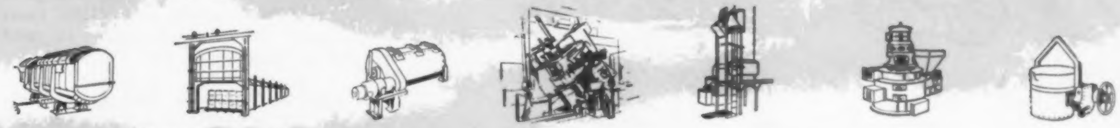

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Book Reviews

Protective Atmospheres . . . A. G. Hotchkiss and H. M. Webber, 341 pp., 167 Fig., 27 tables, 124 ref. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.00 (1953).

Emphasis on practical aspects of protective atmospheres makes this book an operating manual especially useful to those who supervise manufacturing operations. Authors feel "it should aid in selecting the best atmosphere gases for given jobs and in applying and using them wisely and safely in a manner which will produce the results desired." A final section entitled "When Things Go Wrong" and a table, "Summary of What to Look for and What to Try if Things Go Wrong," are especially useful in trouble shooting.

Metallkunde . . . by Prof. Dr.-Ing. Habil. Heinz Borchers, 2 vols., vol. 1—110 pp., vol. 2—154 pp., illustrated. Published by Walter de Gruyter & Co., Berlin, Germany (1952).

Two pocket-size books on metallurgy cover the subject concisely yet explicitly and comprehensively and are a handy reference on the constitution of metals and alloys, as well as their properties and fabrication.

The first booklet briefly covers fundamentals concerning the periodic system, as well as crystallography and lattice structure. Binary and ternary systems are exhaustively discussed and typical examples of technically important systems are illustrated in considerable detail.

The second booklet covers typical properties of metals and alloys, as well as their dependence upon pressure and temperature. Inasmuch as the book is a German publication, reference is made to the D.I.N. Standards. Melting and casting, as well as sintering and metal spraying are covered for the principal materials. Typical photomicrographs show representative structures, and the more commonly encountered defects are elucidated.

The usual phases of thermal treatment (annealing, normalizing, tempering, etc). are described, and currently held theories on the phenomena encountered explained. Surface treatment is briefly stressed, and the fundamentals of welding and soldering are included.

Gases in Metals . . by D. P. Smith, L. W. Eastwood, D. J. Carney, and C. E. Sims. 97 fig., 20 tables, 210 references. Published by American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $3.00 (195–).

Series of four lectures on gases in metals covering fundamental metallurgical and thermodynamic principles, gases in non-ferrous metals and alloys, gases in liquid iron and steel, and in solid iron and steel.

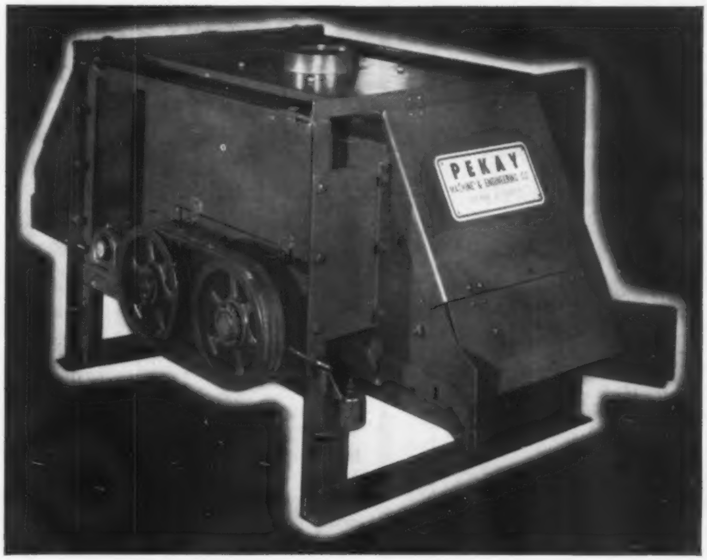
Control of Quality in Melting and Casting . . Monograph and Report Series, No. 15. 74 fig., 13 tables, 38 references. Published by Institute of Metals, 4 Grosvenor Gardens, London, S.W.1, England. $2.50 (1953).

Symposium of six papers on quality control of melting and casting for production of wrought non-ferrous metals and alloys. Includes discussion. Covers principles of control, and quality control in production of: brass, copper and high-conductivity copper-base alloys, zinc and zinc alloys, aluminum alloys, and magnesium alloys.

European Foundries and Productivity . . 272 pp., 89 fig., 9 tables. Organization for European Economic Cooperation, 2002 P. Street NW, Washington, D. C. $3.00 (1953).

Complete report of First European Seminar on Foundry Production held in Paris, November 5-8, 1952. Contains 32 papers describing the attitude of various national foundry industries toward productivity and their application of American productivity ideas, handling of human relations problems, improved organization of personnel, layout, and mechanical handling, specific cases of better productivity, and the role of technical advisory services in improving productivity. Seminar speakers included some of the leading foundrymen of the United Kingdom and Europe.

Object of the seminar was to ascertain how European founders had adapted to their own needs ideas gained on productivity team visits to the United States.



PEKAY

Obituaries

Karl M. Leute, president of Lithium Corp. of America, and also president of Manganese Chemicals Corp., both of Minneapolis, died March 24, in Phoenix, Ariz. In 1937, he founded Electro Manganese Corp. and erected the first successful commercial plant for the production of electrolytic manganese. In 1942, Mr. Leute founded Metalloy Corp., which later became Lithium Corp. of America, Inc. In 1950 he formed Manganese Chemicals Corp. to produce Manganese compounds from low-grade ores in Minnesota.

Ralph G. Sweeney, 55, died in Cleveland in April. He was president and general manager of Allyne-Ryan Foundry Co., Cleveland.

W. S. Robinson, director of Muncie Malleable Foundry Co., Muncie, Ind., died in March. In 1919, he was one of a group which acquired the Whiteley Malleable Iron Co. and the name was changed to Muncie Malleable Foundry Co. In 1947, he was named vice-president of the firm. Mr. Robinson had been associated with the malleable iron industry for 67 years.

George Kramer, sales manager, Lakey Foundry Corp., Muskegon, Mich., died in March.

Herbert R. Replogle, 66, died in March. He was director and real estate supervisor of Warren Foundry & Pipe Corp., Phillipsburg, N. J., until his retirement two years ago.

Martin J. Anderson died in March at Mt. Dora, Fla. He was recently appointed director of engineering research, Mathews Conveyor Co., Ellwood City, Pa. Prior to his appointment he was chief engineer for the company.

Guy M. Polhemus, 60, died in February. He was owner of Central New York Foundries, Inc., Manlius, N. Y.

Herman H. Walther, 57, chief metallurgist and director of Dayton Steel Foundry Corp., Dayton, Ohio, died in March.

Patent Correction

Page 98 of the March issue of AMERICAN FOUNDRYMAN called attention to the Carl-Mayer Corporation's vertical oven correction as being covered by patent No. 2628396. This was an error and should have read: patent No. 2628087.

Chapter Meetings

June

5 . . Saginaw Valley
IMA Lodge, Potters' Lake, Flint, Mich. Annual Outing.

5 . . Toledo
Adams Conservation Club, Toledo, Ohio. Annual Picnic.

11 . . Southern California
Rodger Young Auditorium, Los Angeles, Calif. Past Officers' Night. Dan Blake, "Murder Under Water."

12 . . N. Illinois-S. Wisconsin
Beloit Country Club, Beloit, Wis. Annual Picnic.

12 . . Central Illinois
American Legion Hall, Peoria, Ill. Annual Stag.

19 . . Western New York
Depew Grove, Depew, N. Y. Picnic.

Chesapeake
The Crab Feast and Boat Ride.

Detroit
Annual Stag Outing.

Northeastern Ohio
Annual Outing.

July

30 . . Wisconsin
Maple Crest Country Club. Golf Outing.

August

Washington
5 Mile Lake. Annual Outing.

Wheelabrator to Award College Scholarships

Wheelabrator Foundation, Inc., sponsored by American Wheelabrator & Eqpt. Corp., Mishawaka, Ind., will award annual college scholarships to male employees, and to sons of employees. The scholarships will be known as the Verne E. Minich Founder Scholarship (to Purdue University); and the Otto A. Pfaff Scholarship (to University of Notre Dame).

One scholarship will be awarded annually to each university, with initial awards and annual renewals thereafter in the sum of $650. Under the normal operation of the plan, beginning with the fourth year, eight students will be receiving scholarship benefits each year.

A.S.T.M. Establishes Richart Award

The directors of the American Society for Testing Materials have announced the establishment of the Frank E. Richart Award, which will be conferred for outstanding technical investigations in the field served by A.S.T.M.'s committee C-9. Prof. Richart was senior vice-president of the society when he died in 1951.

Abstracts

Abstracts below have been prepared by Research Information Service of The John Crerar Library, 86 East Randolph Street, Chicago 1, Ill. For photoduplication of any of the complete articles briefed below, write to Photoduplication Service at the above address, identifying articles fully, and enclosing check for prepayment. Each article of ten pages or fraction thereof is $1.40, including postage. Articles over ten pages are an additional $1.40 for each ten pages. A substantial saving is offered by purchase of coupons in advance. For a brochure describing Crerar's library research service, write to Research Information Service.

A456 . . How to Make Sure Your Slings are Safe," Walter C. Richards. *Foundry,* vol. 82, no. 1, January 1954, pp. 137-138. Drawings and tables showing safe loads for various types of slings and cables.

A457 . . "Approach to Foundry Mechanical Handling," C. M. G. Wallwork. *Foundry Trade Journal,* vol. 96, no. 1956, February 25, 1954, pp. 203-209, vol. 96. no. 1957, March 4, pp. 241-246. Author's experiences in developing better, more economical production methods through cost and methods analysis.

A458 . . "Production of Vitreous-Enamelled Iron Castings," A. Adam. *Foundry Trade Journal,* vol. 96, no. 1957, March 4, 1954, pp. 249-254. Problems of vitreous enamelling with particular reference to blistering.

A459 . . "Installation and Maintenance of Conveyor Belting." *Foundry,* vol. 82, no. 2, February 1954, pp. 86-93, 257-259. How to keep belts running straight; how to splice, load, keep wear at a minimum; reasons for belt deterioration.

A460 . . "Casting Titanium," John Ham and Roger Veneklasen. *Foundry,* vol. 82, no. 2, February 1954, pp. 94-95. Brief description of melting and casting of titanium; properties; furnace diagram.

A461 . . "Air Moves the Sand at Allis-Chalmers Brass Foundry," H. Ward Olander. *Foundry,* vol. 82, no. 2, February 1954, pp. 96-99, 260, 263, 264. Diagram, pictures and description of molding sand conditioning and handling system built around pneumatic transportation of sand.

A462 . . "Maintenance of Molding Machines and Core Blowers," George E. Miller. *Foundry,* vol. 82, no. 2, February 1954, pp. 100-101, 173. Maintenance schedule and form for keeping machine maintenance records.

A463 . . "Magnesium Die Casting," G. F. Hodgson. *Foundry,* vol. 82, no. 2, February 1954, pp. 102-105, 252, 253, 254, 255, 256. Primarily discussion of development of growing market in mag-

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Abstracts

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nesium die castings. Melting and casting briefed.

A464 . . "Radiographic Characteristics of High-Energy X-Rays," A. L. Pace. *Foundry*, vol. 82, no. 2, February 1954, pp. 108-111, 178. Use of radiation generated above an equivalent of 2 million electron volts for inspection of large castings.

A465 . . "The Foundryman Considers Quality," E. J. Jory. *Foundry*, vol. 82, no 2, February 1954, pp. 112, 195, 198. Means for improving quality are available to all foundries. The author reviews them and their application.

A466 . . "Casting Defects—Their Causes and Remedies," W. M. Halliday. *Foundry*, vol. 82, no. 2, February 1954, pp. 113, 183, 184, 186, 188. Common defects and how to eliminate them.

A467 . . "Hot Blast Cupola," Bertil Thyberg, *Guteriet*, vol. 44, no. 2, February 1954, pp. 19-28 (in Swedish). Review of history and theory of hot blast cupolas and discussion of melting experience in author's plant.

A468 . . "Mold Irons and the Glass Mold Situation," E. R. Flatter, *Ceramic Bulletin*, vol. 33, no. 4, April 1954, pp. 101-103. No one type of mold iron will meet the requirements for all applications, but nodular iron gives indications of solving the more critical glass mold problems.

A469 . . "Structural Changes During Annealing of White Cast Irons of High S-Mn Ratio," Axel Hultgren and Gustaf Ostberg, *Journal of the Iron & Steel Institute*, vol. 176, part 4, April 1954, pp. 351-365. Mechanism of formation of three types of graphite were studied and produced at will by varying the S-Mn ratio of the iron, hydrogen content of the annealing atmosphere, and annealing temperature. Changes in constitution and shape of sulphide inclusions during annealing and the changes in shape during growth of adjoining graphite were also studied.

A470 . . "Eutectic Solidification in Gray, White, and Mottled Hypoeutectic Cast Irons," Axel Hultgren, Y. Lindblom, and E. Rudberg, *Journal of the Iron & Steel Institute*, vol. 176, part 4, April 1954, pp. 365-374. Solidification of four irons under controlled conditions is reported. In the irons studied, the appearance of the graphite-austenite aggregates, their composition, and their general manner of development, related to cooling curves, indicate direct formation from the melt by eutectic reaction.

A471 . . "Undercooled Graphite in Cast Irons and Related Alloys," H. Morrogh

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and W. J. Williams, *Journal of the Iron & Steel Institute,* vol. 176, part 4, April 1954, pp. 375-378. The authors present evidence to support the view that undercooled graphite in cast irons, iron-carbon-silicon, and iron-carbon alloys arises from decomposition of a carbide.

A472 . . "Solidification of Nodular Iron," H. Morrogh, *Journal of the Iron & Steel Institute,* vol. 176, part 4, April 1954, pp. 378-382. Graphite nodules can be formed directly from the melt and also by decomposition of acicular carbide according to this investigation.

A473 . . "Solidification of Iron-Phosphorus-Carbon Alloys," H. Morrogh and P. H. Tutsch, *Journal of the Iron & Steel Institute,* vol. 176, part 4, April 1954, pp. 382-384. Instead of normal ledeburite, small amounts of phosphorus cause the formation of a degenerate eutectic structure while large amounts give rise to austenite dendrites and cementite having a hypereutectic appearance.

A474 . . "Decomposition of Cementite During Solidification of Cast Iron," A. Berman and V. Kondic, *Journal of the Iron & Steel Institute,* vol. 176, part 4, April 1954, pp. 385-387. D-type graphite can form by cementite decomposition according to this investigation of the time required for graphite to form on cooling with that required for cementite to decompose at the eutectic temperature.

A475 . . "Growth of Nodular Graphite," M. Hillert and Y. Lindblom, *Journal of the Iron & Steel Institute,* vol. 176, part 4, April 1954, pp. 388-390. Screw dislocations caused by inclusion of foreign atoms in the graphite lattice may cause growth of graphite spherulites. As evidence, distribution or rare-earth elements in spherulites is shown by autoradiography.

A476 . . "Correlation of Gamma Radiography and Magnaflux Indications in the Inspection of Large Cast Steel Connecting Rods," R. L. Thompson, *ASTM Bulletin,* no. 197, April 1954, pp. 58-59. Case history of detection of severe shrinkage cracking in a alrge steel casting.

A477 . . "Foundry Flexibility Permits Versatile Plant Operation," Harold J. Wheelock, *American Foundryman,* vol. 25, no. 3, March 1954, pp. 34-36. Foundry operations in medium-size specialty iron and steel shop making castings ranging from 1 oz to 75 lb. Includes plant layout.

A478 . . "Use of Dielectric Ovens Speeds Core Production," Greg Minogue, *American Foundryman,* vol. 25, no. 3, March 1954, pp. 37-39. How malleable foundry

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improved core production and quality with dielectric core baking equipment. Includes layout.

A479 . . "Productivity Ideas Increase British Output at Small Cost," *American Foundryman,* vol. 25, no. 3, March 1954, pp. 42-46. How small British iron foundry applied ideas picked up in visits to United States shops.

A480 . . "Casting Quality as Related to pH Value of Molding Sands," Victor E. Zang and Gerald J. Grott, *American Foundryman,* vol. 25, no. 3, March 1954, pp. 49-59. Theory of pH control of molding sands with data and illustrations of castings to show how scabbing was reduced.

A481 . . "Shell Molds for Titanium Castings," R. M. Lang, *American Foundryman,* vol. 25, no. 3, March 1954, pp. 60-62. Zirconium oxychloride wash improves the surface finish of the casting and drastically reduces the amount of pinholing but does not decrease the over-all depth of contamination.

A482 . . "Methods for Special Pipe Production in Australia," G. J. Benson, *American Foundryman,* vol. 25, no. 3, March 1954, pp. 63-67. Production of large gray iron pipe and fittings for irrigation in Australia. Step by step explanation of method for strickling 5-ton faucet tee and 3.4-ton elbow are given, including casting of hold-down plate and core arbor.

A483 . . "Strength of White Irons in the Temperature Range of Hot Tearing," J. P. Frenck and R. W. Heine, *American Foundryman,* vol. 25, no. 3, March 1954, pp. 68-72. Commercial white iron tensile bars are shown to have strengths at 2030-2200 F of the same order of magnitude as the hot compressive strength of molding and core sand. Contraction of a few thousandths of an inch can cause complete tearing.

A484 . . "pH Value — a New Foundry Term," Clyde A. Sanders, *American Foundryman,* vol. 25, no. 3, March 1954, pp. 94, 96, 104. What pH is, equipment used in measuring pH, pH values of various binders and sand mixtures and what they mean.

A485 . . "Study of Microporosity in Magnesium Alloy Castings," M. Bardot, *Fonderie,* no. 94, November 1953, pp. 3687-3692 (in French). In a study to determine the effects of degassing during molding on the microporosity, an investigation was made of castings of two magnesium-base alloys: G-A9, containing 8.5 per cent Al and small quantities of zinc and manganese; and G-A6, containing 6 per cent Al, 3 per cent Zn and a

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small amount of manganese. It was found that the alloys are not extremely sensitive to the effect of gas, but that the contour of the pieces is important. Hollows with large curvature are not recommended.

A486..“New Al-Zn-Mg Foundry Alloy,” Eugenio Hugony, *La Fonderia Italiana*, vol. 2, no. 11, November 1953, pp. 651-655 (in Italian). A description is given of the properties of a new alloy of aluminum with zinc and magnesium. It contains 5.1 per cent Zn, 0.6 per cent Mg, 1.1 per cent Fe, and 0.2 per cent Ti and can be used for both chill and sand castings. While having favorable foundry characteristics, satisfactory mechanical and anti-corrosive properties, the alloy shows somewhat pronounced shrinkage and a fragility at elevated temperatures that may limit its uses in complicated castings.

A487..“Growth and Orientation of Crystal Elements in Eutectic Alloys,” H. Tober, *Metalen*, vol. 8, no. 24, December 31, 1953, pp. 431-436 (in Dutch). Contrary to findings of other writers, the author's experiments showed that no marked correlations exist between the crystalline axes in the two phases of a eutectic alloy, or between these axes and the orientation of the lamellae. The material used consisted of metallographic preparations of the Ag-Cu eutectic which were observed with the aid of a thin pencil of x-rays. Combined Laue-Debye-Scherer diagrams allowed a ready distinction between monocrystalline and polycrystalline structures of a given phase, as well as the determination of predominant orientations of crystal axes.

A488..“Toward an International Classification of Methods of Testing Cast Iron,” J. Foulon, *La Fonderia Italiana*, vol. 2, no. 12, December 1953, pp. 689-694. (in Italian). A comparison of the standard methods used for the testing of cast iron in various countries in Europe and in the United States is made, and the wish is expressed that steps toward a universal standardization be taken.

A490..“Use of Scrap Iron and Steel in the Cupola,” Charles Dennery, *Fonderia*, vol. 2, no. 11, November 1953, pp. 437-451 (in Italian). A critical consideration is made of the current views on the use of scrap iron and steel in the cupola, a practice that has proved its value in reducing the costs and improving the quality of the product. Contrary to widely accepted opinions, the author thinks that all normal cupolas answer the purpose, that the use of steel does not justify such large amounts of coke as are frequently encountered, and that the thermal balance sheet has no correlation with the cost of the liquid cast iron.

LIFE SENTENCE

The whine of the crane as it clanks
  down the track,
The roar of the cupola blasting its
  stack,
The furnace electrodes' unearthly
  shrieking,
The hiss of an air hose connection
  that's leaking,
The rumble of rollers, mulling the
  sand,
The core stock and facing that lumps
  in your hand,
A coremaker working and humming
  a song
(He'll cuss just as loudly when
  something goes wrong.)
Such is the scene in a foundry.

Every man has his visions of settling
  down
In a vine-covered shack at the edge
  of the town
Raising chickens and rabbits and
  children as well
Raising corn and potatoes and maybe
  some hell . . .
It's all right to dream, but, listen here,
  Bud,
There's something about it that gets
  in your blood.
In spite of the pleadings of children
  and wife,
If you stay here a year you'll remain
  all your life.
Such is the way of a foundry.

The four-thirty whistle—then out
  through the gates . . .
A couple of beers . . . and wifey awaits
In the door of the cottage.
You've been drinking again,
You'll never get out of the foundry."

In the doghouse all day, in the
  doghouse all night.
No rest for the weary . . . but wifey is
  right.
I'll never get out of the foundry.

From Rammed Up and Poured, book of foundry poems by Bill Walkins, obtainable from the copyright owners: Electric Steel Foundry Co., 2141 North West 25th Ave., Portland 10, Oregon. Price, $1.85.

French Hold Elections

The general assembly of the Association Technique de Fonderie, Paris, has elected officers for 1954-55. New president is M. Gustave Rivoire, Ingenieur E.S.F., directeur de fonderie. M. Charles Cury was elected first vice-president. He is Ingenieur E.S.F. et Industrial, Ets Cury & Charrier à Deville (Ardennes). Other vice-presidents are Messrs. Paul Blanchard, Charles Dennery, Jean Laine, Jacques Boucher, Guy Henon, and Raymond Jacquemart. M. Andre Debar is general secretary; treasurer is M. Henri Prevost; and assistant treasurer, M. Edmond Gabriel Laffly.

Index to Advertisers

Classified

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